SCIENCE

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THE PROVINCIAL UNIVERSITY IN CANADIAN DEVELOPMENT[1]

THE problems involved in the development of Canada are not to be compared with those of any other country in the world. Her remoteness from the center of imperial government and her close social and business association with the friendly neighbor to the south, who of necessity can not understand her relations to the mother country, have not served to disturb her poise.

To develop, round out, fuse and nationalize Britain has taken two thousand years. In the making of that portion of Greater Britain, the Briton, the Pict, the Scot, the Roman, the Saxon, the Jute, the Angle, the Norman and even the Spaniard, since the time of the Armada, have been fused, whilst the Jew has furnished an increasingly important strain for the past thousand years. Nor has Germany failed to make her contribution to our highest social and governmental strata. The facilities, however, for rapid nation-building have increased by leaps and bounds, of which the chief is ease of transport and communication.

In the United States, the world has had the opportunity to see the creation of a nation in a day, where the scores of elements have been garnered in the four corners of the earth from those countries whose centuries of growth have brought overcrowding and in some have given birth to intolerable conditions.

In Canada, the same conditions obtain as are to be encountered in the United States, with the difference, however, that the Anglo-Saxon dominates, British tradi-

[1] An address given on the occasion of the inauguration of the first President of the University of Manitoba, at Winnipeg, on November 19, 1913.

tion governs and her law and rule are paramount. Also inevitably Canada must afford ultimate relief from the overcrowding of her older neighbor.

The problem of Britain, Germany or Japan is quite another story. These nations in their growth, as well as others which can be easily called to mind, are endogenous, that is, in them development proceeds from within. In the United States and Canada and those countries which are being populated more largely by the immigration of other peoples than by that natural increase which depends upon birth rate, there is crying need of certain nation-building mechanisms, whose function shall be to secure rapid fusion of bloods, and formulation of common standards which shall serve to develop a people of the highest type. In Canada, the ideas and ideals are grown from British seed and transplanted to new-world soil but must have engrafted upon them an international viewpoint suited to her many peoples in order that the full fruition of Canadian national efficiency may be her contribution to the empire.

This very difference in population assets, which in Britain are fixed and in Canada fluid, is a very real difficulty, although by no means insuperable.

The diffusion of accurate information from each portion of the empire to every other part will enable each of the dominions to effect sufficient modification in British procedure and viewpoint for local needs, without fear of being regarded either as lacking in loyalty or too widely divergent from tradition. Canada's task is that of constructing a nation almost "while you wait," which must, however, be a part of that *supernation* upon which the sun never sets. Hers is a constructive problem. She builds anew and does not have to dwell in chaos amid the litter of tearing down whilst she rebuilds her whole national fabric. She will therefore do wisely to profit by the experiences of the older nations in order that there may be no need of the uneconomic and tragic task of reconstruction.

In the development of Britain, undoubtedly her peregrinative propensity involved in sea supremacy has been the natural and rational outcome of her geographical position. In this, our parent country affords us the best possible example in the matter of profiting from the experiences of other peoples and the adaptation of their methods to British needs, whilst at the same time she has given to the world British standards of fair play, established justice, and carried law and order into the Seven Seas.

Japan at the present moment is perhaps the most conspicuous example of what a definite coordinated plan of procedure may do in hastening the solution of very real and pressing economic, social and political difficulties, dependent upon increase of population and limited territory. Her sons are models of patriotism in their eager willingness to expatriate themselves for years in order to bring back to Japan those up-to-the-minute scientific and cultural stimuli needed for national metamorphosis. Apparently, she seeks to be the carrying nation of the Pacific, realizing, as Britain did before her, the real power and opportunity which lie in the assumption of such a function.

She is developing an educational system of which her university is an important part. She is training her youth, not only by manning her schools and universities with the best obtainable talent of other countries, but in every land and in almost every university are Japanese who are gladly sacrificing years of their lives in order to bring home what she needs at this critical period. Her amazing success in the

development and maintenance of physical fitness in the avoidance of disease and in the care of her wounded during the Russo-Japanese war startled the world. It is, however, only one of the many examples of the phenomenal advance which has resulted from her most painstaking and patient efforts to carry out, systematically and in detail, a carefully designed and fully matured plan for securing national efficiency.

The value of such a far-sighted nation-wide scheme is to be seen in the present most wonderful economic and social revolution which is being effected in Germany. The careful preparation in advance of a program by which the state recognizes and provides education in all its stages and in all its phases, from the highest cultural development to the most practical industrial training, is to be credited with the marvelous progress of this country.

It does not suffice to leave to private effort and volunteer organization the provision of sources of culture and scientific study which may or may not become *directly* related to the practical upbuilding of a people. If the state assumes any responsibility at all for education, scientific research, investigation, cultural development and art, she should coordinate her various mechanisms, and see that all possible avenues are opened for the *direct* as well as the *indirect* benefit of the whole people.

Great Britain, though somewhat late in recognizing that education is apt to lag behind instead of dominating social and industrial relations, is rapidly establishing provincial universities and agricultural and technical schools which are being extended in scope and increased in number. The prestige of having the finest cultural centers in the world without available channels for conveying direct to all the people the knowledge of the few, was not meeting her needs.

The development of the state university in the United States and its orientation in the educational system of the commonwealth has been the cause of amazement to the whole world, including some of the older seats of learning in that country itself.

Beginning with Ontario, Canada is developing a system of state or provincial universities. She has every reason to feel proud of those provinces which have taken up this logical and natural as also inevitable function, and no university in America, whether supported by state or private endowment, has developed finer standards or achieved more real success than the University of Toronto.

In order to meet her many peculiar conditions, some of which have been already mentioned, Canada must bring to her work all the help which can be afforded by the other nations of the world. She draws her citizens largely from them. Some of these are capable of adding immediately to Canadian cultural and scientific prestige. Many, however, must be regarded simply as raw material, brought to Canada for the purpose of their individual and collective improvement.

To hasten the process of Canadianizing them and to derive the greatest national profit from the best and the worst in the shortest possible time are most important.

If we are not satisfied to wait until the second or third generation for results, we must provide leaders who know conditions in both lands. The best brains of their countries may be used to leaven our land. They and Canada's strongest sons who have been trained in both lands are needed in our universities and schools.

The example of Japan in this matter is worthy of our emulation if we are to take and keep our place with other nations and

bring to the empire what she has a right to expect.

There is no one force which can do more in this important undertaking than the provincial university when properly articulated with the other educational units of each province, if these resulting provincial systems are properly coordinated and organized into a workable national mechanism.

CONSERVATION OF NATIONAL RESOURCES

It is most important that we appreciate our responsibilities for the heritage which has been given us. We must not be intoxicated by the realization of nature's prodigality. In the exuberance of our youth, we must not sow national wild oats for our children and children's children to reap.

We must conserve our national resources intelligently, which means that we must use and not abuse nature's gifts to us. We can well take warning from the experiences of the United States, where it is being found necessary to hold annual conservation congresses, one of which is now in session at Washington, D. C. At this congress, forest conservation will receive first attention, the desire being to specialize on some one phase of the conservation program at each meeting, for the purpose of achieving more lasting results. In the call issued for this congress, the following announcement is made:

> The fifth National Conservation Congress is to be devoted largely to forest conservation, because of the national importance of the subject in its many phases. Public interest is involved, because upon the proper solution of the various problems depends the cost of the wood without which our civilization would decline; the perpetuation of the timber supply; the development of hydro-electric power; the utilization of non-agricultural lands; the availability of water for irrigation; the preservation of forest areas for health and recreation; and many other developments essential alike to every citizen from the lumberman to the man who owns neither a tree nor a foot of land.

The congress will endeavor to diffuse more information and develop better methods for the prevention of forest fires which cause such tremendous loss of life and of property valued at over fifty million dollars annually, and which also damage the soil, the water and the young timber growth. The study of forest insects is important, since they destroy enough timber every year "to finance the construction program of the navy." The relation of floods to forest denudation, which is in part responsible for the disasters of the current year, will be studied.

The need of knowing exact conditions so as to avoid the use each year of three times the annual timber growth is apparent, particularly when we realize that only forty to seventy per cent. of each cut tree is utilized, while fires are destroying annually the equivalent of this growth. The use of preservatives for the treatment of wood with the view of prolonging its life when used in constructive work is important because through it we have promise of reduction in forest consumption and the possibility of increasing supply by utilizing inferior species of woods at present not available. Another object of the congress is to meet the need on the part of the public for a safe national forest policy against which there seems to be strong opposition.

These details are cited, not because they constitute Canada's most important national waste, but because it is the one which at this moment is receiving recognition and study by our neighbors.

The conservation of the soil elements, the utilization and preservation to the people of water powers, mineral wealth and above all, that chiefest national asset, the public health and human vitality, surely constitute a present-day responsibility, if the

Canada of the future is not to curse the Canada of to-day.

Our land is full of opportunity. Our spaces are wide. Citizens of less fortunate countries, which have wasted their opportunities and shirked their responsibilities until too late, have turned their eyes towards Canada.

Canada has a right to expect, both from her own and her foster children, that they shall use but not abuse their unrivaled chances for national and world betterment. We shall be wise if we see and provide in time the proper mechanisms for harmonizing rapid development with proper conservation of resources before we are fighting for the room and the right to breathe by reason of our overcrowding when we should be unable to think clearly and act intelligently and realize too late that in our short-sightedness we have made unwarranted overdrafts on nature's storehouse.

Facilities for rapid transit and free communication have enabled Canada to have at her command, while she yet has room, all the equipment evolved by the older and more crowded nations. Pioneering in the year 1913 is indeed "*pioneering de luxe.*" This, whilst a matter of self-gratulation for increased opportunity, brings also added responsibility to our generation.

The necessity for the provision of national and provincial facilities for seeking out, accumulating, weighing, standardizing, adapting and diffusing knowledge require no argument: in fact, the newer provinces in the middle and far west have already anticipated this need and we are now met to celebrate an important step in the development of our prairie province from whose ample bosom is derived that sustenance upon which so many in this and other lands have come to depend.

The Canadian government has not been blind to the value of such knowledge to the people. The provision of a fund of ten million dollars to be distributed throughout the Dominion for the benefit of agricultural instruction is a splendid national investment. This far-sighted policy under the direction of such wise leaders of Canadian progress as Dr. C. C. James, will bring much that is needed, not alone to the agricultural interests, but to all of us.

SCOPE, VALUE AND COST OF PROVINCIAL UNIVERSITIES

In the consideration of the function and scope of a provincial university, we should carefully consider the end sought, the benefit to be derived, the means available and the cost of installation and operation. At the present day we are not staggered when confronted with the necessity of spending hundreds of millions of dollars on railways, whose construction is necessary to open up new lands. We pledge our own generation and our children to the payment of vast sums for advantages which sometimes remain problematical for years. We see the need for tremendous capital investment in the matter of mines when sometimes many years elapse before production yields satisfactory dividends. The dividends to be paid by our educational system are not all to be expressed in terms of dollars and cents, but they are sufficiently obvious to induce those states which have had most experience to invest more deeply every year.

I had the honor to deliver the second annual opening address before the faculty of science of the University of Manitoba in October, 1907, at which time I spoke upon "State Responsibility in University Education." On that occasion I gave the available figures for capital and maintenance expenditures in certain of the state institutions in the mid-western portion of the United States. At that time, Wisconsin

was spending for all purposes something over one million dollars per annum. Minnesota's outlay for current expense was over $650,000 per annum. Illinois had available considerably over two million dollars for all purposes for the biennial period.

Only six years have elapsed and yet for the current year 1913–14 there is being expended by each of the three state universities—Minnesota, Wisconsin and Illinois—in round numbers, two million dollars per annum for current expenses, which excludes not only building, but equipment outlay. This increase of approximately three hundred per cent. in six years in expenditure undoubtedly would not be made were it not for the fact that those three states are convinced that they are receiving satisfactory dividends on those combined annual outlays of over six million dollars. That they are being repaid in many more directions than they realize during those early years seems likely, because in the modern university, as in a railroad or other important public utility, the initial cost of installation and operation, as also of extension, must inevitably be very much higher in relation to efficient service than in later years.

For the proper fulfillment of her function of developing leadership in every phase of social and economic development, the provincial university must of necessity keep pace with all human knowledge and add her share to the sum total. When we remember the additions which have been made to our armamentarium in our own generation, we shall be prepared to plan generously for the future.

It requires no mental effort, however, to understand that in order to prepare as well the youth of to-day to meet his responsibility as we were prepared to meet ours, a greater range of teaching and experience must be provided because of the added knowledge of one generation.

The standpoint of the youth of to-day is not very different from that of our own. He believes that his capacity is greater and his viewpoint wider than those of the preceding generation, just as we unblushingly admitted our superiority over our predecessors. Even admitting his increased mentality for the sake of argument, we realize that the youth of to-day can not avail himself of all of our sources of information as well as those which have been discovered since his time. Notwithstanding the increase of human longevity, we are not yet warranted in insisting that thirty or more years be expended in preparation for an active working period of a like term.

Nevertheless, universities must maintain all the departments of real knowledge which were available to earlier generations whilst developing those of importance to the present and coming generation. If she is to be the chief mechanism for the diffusion of knowledge, she must be the leading explorer in unknown fields in order that our stock of knowledge be increased. Upon her rests the responsibility for finding out and bringing over from older and other lands, all that is worth while. She, too, must take a leading place in the investigation of local resources and develop methods for their more intelligent utilization. Thus each province will come to know the resources of other lands and of other provinces and at the same time be in a position to afford exact information and the best possible service to others who need what she has to give.

Canada needs experts in special lines, some of which deserve mention.

Household Administration, Home Economics and Domestic Science

These are terms with which we are all familiar and indicate that this generation is waking up to the need of special train-

ing for the most important work in nation-building. The successful making and keeping of the home is indeed a profession which requires the most careful training of women of the best moral fiber and the highest mental equipment. The housekeepers of our land are those who perhaps spend the bulk of the nation's money. Yet in the past there has been little in the way of careful training for this most important economic work. The home-keeper is not less important in our social development. We leave to our women very many nondescript duties included in the care of the home. She it is who knows all details of the children's physical and intellectual progress. She has accurate information about our schools. To her we turn when problems of civic house-cleaning and housekeeping arise through man's negligence. It is, therefore, most appropriate that at length we are providing practical as well as cultural training in order to enable woman to meet some of her obligations.

Universities must train our leaders in women's work and provide facilities for research in the science of home-making and the art of housekeeping, if the word "*home*" is to remain current in the Canadian vocabulary, and this most important phase of our national life is to keep abreast of commercial and industrial progress.

AGRICULTURE

In agriculture we have many problems which are of tremendous importance and interest. The fascination of studies which may lead to the growth of two stalks of wheat where one grew before, of a head which has a double number of grains of the same size, or the same number of grains of double size or a strain which improves quality without impairing quantity, or is adapted to land which was formerly unprofitable or useless, can not fail to arouse national and even international interest since it concerns the food supply of the world. Such studies as those which resulted in the production of the Marquis wheat in Canada, or the work of Hayes in Minnesota wheats, or of Zavitz of Guelph on barleys, have meant millions upon millions of dollars to the new world and food for the nations. The expeditions to Asia of Hensen, of South Dakota, in the search for, and development of, alfalfa suited to cold winters and dry summers brought about an economic revolution and furnished a story as fascinating as is to be found in literature. Babcock and Russell have added millions annually to Wisconsin's assets through their contributions to the making of cheese, butter and other milk staples.

However, these are only a few of the rural problems where scientific, patient work, and wide propaganda are needed. Humanity is traveling cityward and the best of our peoples must have their faces turned again to the country, if we are not to suffer disaster. This means that rural life must be made possible. It must become a life and cease to be an existence. Toward this end every influence in our provinces and in our land must be brought to bear, but it is quite as much a social as an economic question. It includes cultural and artistic phases quite as much as scientific agriculture and the food supply. It also must not lose sight of rural hygiene.

In our land we have many problems which relate indirectly to the soil, and we realize at once that we must develop agriculture as a profession comparable in all respects to other professions. For this work, undoubtedly, we must also develop an artisan class with industrial training just as we must take pains to foster the teaching of other trades and callings.

It is to be hoped that all our universi-

ties will bring every influence to bear to establish anew the dignity of labor. It must be confessed at the present time that Canadians, like Americans, are abandoning manual work as fast as they can to newcomers from Europe and Asia. Either the creation of a peasant class must be squarely faced at this time or the dignity and the vital need of labor must be duly impressed on Canada's native sons. We must return to the ways of our fathers. We must all work if we would be strong, and we must be strong if we would work.

FORESTRY AND FOREST ENGINEERING

The need for the study of forestry and of horticulture is becoming better recognized. Wisconsin has a forest-products laboratory built by the federal government and maintained by the state university, in which such problems as those which are now engaging the attention of the Fifth National Conservation Congress are studied. Every one interested in agriculture needs to know about shelter belts, the care of fruit trees and kindred subjects. Not only for forestry in relation to agriculture but for forest engineers there is an increasing demand. In such countries as British Columbia, the provincial government needs them for the proper conservation and intelligent use of its forest resources, and the Dominion government for its large timber holdings, whilst the transcontinental railways have in their possession vast forest tracts.

The important corporations whose operations are extensive in lumbering industries will need men who are trained in botany, animal biology, chemistry, physics, mathematics, engineering, economics and commerce, in order that they may fulfil those functions which they may reasonably be called upon to perform.

ENGINEERING, ARCHITECTURE, MINING AND COMMERCE

In Canada pioneering has spelled engineering. We lay out and build roads and railroads, construct bridges, tunnel mountains, discover, measure and harness water powers, prospect for and produce from mines, and in every way possible explore and develop our country, realizing at the same time that as yet we have not well begun. We have to develop our resources and facilities for our own use and also in order that we may exchange our commodities with other nations. Chemistry, physics and biology have all to be utilized in our manufacturing processes in increasing degree. Our people have to be housed and so have our industries, we and our products have to be transported. We must fetch to and carry from other nations. Naval architecture and building must be improved even yet. Markets and marketing require most careful investigation and report. Business needs to be put on the plane of a profession and in our universities, pulpits and forums, only one brand of ethics need be taught. The golden rule brought down to date will serve this and many other generations.

For all these activities we must busy ourselves in training men. Our universities need no longer argue the question of whether college men can "make good" in the practical walks of life. The people want more of them. That is why they are providing the provincial and state university with departments, schools and colleges to develop these branches.

LAW

Pioneering is the struggle with nature, the fight with things, the adjustment of the rest of the world to man. As soon as we arrive at the stage when we touch elbows—begin to be "civilized" forsooth—we have

need of the lawyer to help us adjust man's rights to mankind's needs. We do wisely if we train these men carefully who are to compose our difficulties, lest they only stir up strife where they should be strenuous for peace. We expect them to be the leading force in developing society by making the individual conform to the mass. They must therefore be men of the highest integrity and trained most broadly. They need a knowledge of what has gone before. They need all the cultural training available and they most certainly need some information in regard to the sciences if they are to be intelligent in the making and interpretation of laws which are intended to crystallize our most advanced thought and fix common procedure.

The preceptor system is ideal when the student is articled to one who can and will teach and who feels at once his opportunity and his obligation. It is, however, as unreliable as it is antiquated, and is antiquated because it is unreliable. It belongs to the dark ages when public schools and compulsory education were unknown. Whilst medicine has taken many liberties with pedagogical principles, she has long ago given up the apprentice system, and of recent years has introduced modern teaching methods into her schools. Law must inevitably follow. The public will doubtless develop state mechanisms for training our lawyers, who have meant and must continue to mean so much to British progress and national stability. British law is the pride of the empire.

MEDICINE AND ALLIED BRANCHES

The people realize in increasing degree that the provision of better physicians and nurses for their children is the best possible public investment, a form of life insurance that is safer than any other. They understand that it is the people's business to provide adequate training and to insist that those who are to be entrusted with the lives and welfare of our citizens avail themselves of that training and present satisfactory evidence of proper qualification for their work. Medicine is being increasingly socialized. We are drifting perceptibly nearer to the time when the doctor will be a public servant and not a member of a privileged class. It is therefore only just and right that he be trained at public expense. This means provision not only of biological, chemical and physical laboratories, but laboratories of medical science, clinical laboratories, hospitals, dental infirmaries, dispensaries, nurses' homes, and other such facilities, all as a part of the equipment of a provincial university.

The expense of such an undertaking should properly be assessed not alone against the university, however. It is a good public investment when the by-product more than pays the total cost of operation. The teaching hospital, the backbone of such a university school of medicine, by returning to the community from which the patient comes a self-supporting and independent citizen in lieu of a helpless being—a burden to himself and others—is far more than paying the cost of maintenance. In fact, the cost of operating the hospital and its associated laboratories should really be charged not to education, but to public works, not to life insurance for our children, which medical teaching means, but to current provincial business, which increases the earnings of to-day. We are learning to know that in fairness both to the sick who can not work, and to the well who must work, the place for the sick is in the hospital. The sick can not receive such kind and efficient care at home whilst the amateur nursing and household disturbance both interfere with the work and reduce the vitality of the well.

PUBLIC HEALTH AND SANITATION

To provide for medicine is not to meet the needs of public health. Its conservation involves phases of medicine, engineering, law-making and enforcement, sociology, economics, education and many other lines of endeavor. The construction of the Panama Canal, that marvel of engineering, has been possible only because at length man has been able to stay the hand of the grim destroyer. The annual death toll under the De Lesseps regime was one out of each ten. It is now less than one out of each hundred amongst the white employees in the canal zone.

The same forces of nature which science has tamed for man's use and pleasure, the biological and physical sciences, have been applied in the war with disease. Death can be postponed and man's working period lengthened. Man was in sad need of improved weapons for his own defense in view of the rapid multiplication of complexities developed by modern life which masses thousands together in a few minutes and as quickly disperses them. Velocitamania—speed craze—is the microbe's friend, whilst our high tension life gives him the needed hold by increasing vital waste. In turn, hygienic success and extension of man's active period means increased population and adds new problems to the many perplexities of the engineer, the architect, the sociologist, the economist and the statesman. And so we are mutually helpful and mutually harmful.

We have come to recognize that the individual's fitness is not only his prime business but the public's affair as well. In increasing degree are we interfering with personal liberty for the benefit of the race. In line with this tendency we must undoubtedly expect to see colleges and schools of public health, as differentiated from medical schools, developed in our state universities. They can only succeed by enlisting all official and volunteer public health agencies in the training of workers for the many fields in which specialists are required. They involve so much of basic science and culture that they can be developed only in universities and will be most successful in state or provincial or federal universities. The members of the teaching corps are already available if we add the trained workers in official and voluntary public health services, who can furnish the practical work which in the language of the medical school might be termed "public health clinics."

It is time that all those who are charged with responsibility for the care of the public health be trained before they undertake that responsibility rather than to receive their training at the expense of the public welfare. This the public realizes and will demand.

PEDAGOGY

With the advance in professional and industrial education has come a very real need for teachers' colleges which can not be met by our normal school system. Their proper home is in our universities since they require on their staffs the very men there available. They must be taught to know and then to teach. We must teach teachers of domestic science the mechanic arts, agriculture, nursing, personal hygiene and many other lines of work. These embryo teachers must have their practise schools to learn under proper direction the art of teaching. A nice articulation must be made, however, in order to see that in our educational system there is neither uncovered ground nor undue overlap. The need of training drilled public servants available for permanent positions in a stable profession is so overwhelming that there is little present danger of overlap.

THE NEED FOR TRAINING PROFESSIONAL COORDINATORS

Life is a continual fight with physical, biological and social environment. In the struggle man has gradually acquired a composite equipment. As in the process of evolution from single celled organisms to the higher animals there is loss of cell versatility and acquirement of very special function on the part of cells, cell groups and systems, so in the social organism development has come about. We have come far and are going farther towards specialization. Our increase in aggregate knowledge has come by this very specialization, yet whilst this gives each of us more power in his own sphere it makes him increasingly dependent upon others. The more knowledge we acquire in our own field, the less we are apt to have in our neighbor's. Inevitably we shall become incapacitated from over-specialization unless we develop our "*social nervous system*" to a corresponding degree. Our problems become more largely governmental. We need professional coordinators; we require those who can comprehend and compel cooperation. We have come to the point in our development when we must have trained statesmen, publicists, journalists, social experts, public hygienists, lawmakers, and last, but not by any means least, spiritual advisers and leaders. As man gets to know more about himself and his environment, and learns to control in increasing degree the forces of this world, he does not lose interest in the question of whence he came and whither he goes. He needs to be understood and helped whilst here, however. We begin to see more clearly the relation between disease and morality, between poverty and crime and between poverty and sickness. We know that physical efficiency is inexplicably interwoven with mental and moral vigor. We appreciate better each day the unrighteousness of ignorance and of disease, as well as of doing less than one's best.

LITERATURE, THE ARTS AND SCIENCES

Mention of these has been reserved till now because of the obviousness of their place in any scheme of university development. At no very recent date they largely constituted the college and university curricula, with the exception of science, which has only become respectable in Cambridge within a generation and is now being tolerated in Oxford. We can not so well develop agriculture and other industrial activities which involve science and culture independently of them, since their ramifications interdigitate with and involve all our social and economic functions. These interrelations are so self-evident that no argument is needed in support of the claim for increase in efficiency and the decrease in effort and expense which result from a policy which coordinates these branches and provides a system of vital checks and balances. Home management, agriculture, forestry, engineering, architecture, mining, manufacturing and commerce, medicine, law, public health and all such practical workaday phases of our national life are rooted in the arts and sciences. They presuppose the culture of the humanities, a familiarity with the fine arts, a foundation in the life and literature of the past, a knowledge of current events in this and other lands and the possession of linguistic and other such tools. They are the more practical application of biological, physical and social sciences to the betterment of man in order to place him *en rapport* with his environment and adapt his environment to his requirement as well as to adjust the rights and obligation of man to the needs of mankind and the will of his Creator.

To divorce literature, science and the

arts from the crafts, the industries and the professions is unthinkable. The dreamer needs the doer, the artist needs the artisan, the poet needs the planner, the scholar needs the statesman. The man with the telescopic eye, who sees so clearly the things of to-morrow, but trips over the threshold of to-day, needs the social myopic whose condition results from too close and too prolonged contact with the minute work of the world. One warns the other of things to come whilst he in turn is protected against the dim dangers of the day. The so-called practical men need theory, and the theorists need practise. The workers need uplift and the apostles of culture need contact with the earth. The people's university must meet *all* the needs of *all* the people. We must therefore proceed with care to the erection of those workshops where we may design and fashion the tools needed in the building of a nation and from which we can survey and lay out paths of enlightenment, tunnel the mountains of ignorance and bridge the chasms of incompetence. Here we will generate currents of progress and patriotism while we prepare plans and begin the construction of a finer and better social fabric than the world has known. Having done our best to found provincial universities without provincialism, let us pray that posterity may say of us that we builded even better than we knew.

It 's the olden lure, the golden lure, it 's the lure of the timeless things.

F. F. Wesbrook
The University of British Columbia
November 19, 1913

THE INDIAN LADDER RESERVATION

Geologists in many parts of the world will be interested in the announcement recently made of the gift to the state of New York as a public park of the "Indian Ladder" and its adjoining portions of the Helderberg mountains escarpment in Albany county, New York. Next, perhaps, to the Schoharie Valley, the Helderbergs and the Indian Ladder have the most intimate and ancient association with the history of geology in this state and are really a classic ground in American geological science. Interesting not alone for its geology, as the original section of the "Helderberg formation" and its various subdivisions, with their profusion of organic remains, the Indian Ladder is equally commanding as a scenic feature. There is perhaps nothing just like it in origin and effectiveness. From the summit of the long sheer limestone cliff the eye commands the panorama of the conjoined Hudson and Mohawk Valleys picturesquely spread out over a vast area bounded at the north by the foothills of the Adirondacks and at the northeast by the Taconic mountains and the Berkshires. And over this splendid picture generations of geologists have gazed, for the Helderbergs have been the Mecca of geologists for well nigh a century.

The generous gift to the people of New York State comes from Mrs. Emma Treadwell Thacher, widow of the late Hon. John Boyd Thacher, a distinguished statesman, historian and litterateur. Its more than 350 acres extends along the escarpment so far as to include all its most striking portions and the new reservation is essentially a geologic and scenic park. It was the intention of Mr. Thacher that it should have this ultimate disposition. Mr. Thacher, who had a summer home in the Helderbergs, was much in Europe engaged in his historical researches. On one of his returns he told me that he had heard so much of the Helderbergs, their rocks and their fossils, among circles of savants with whom he was thrown that he determined to do his part to preserve this famous cliff from any danger of invasion, because of its natural beauty and extraordinary scientific interest. Impressed by the worth of preserving such natural monuments, Mr. Thacher's high-minded purpose has now been made effective.

John M. Clarke
New York State Museum

THE OHIO STATE BOARD OF HEALTH AND THE OHIO STATE UNIVERSITY

THE first move in the general plan to increase the cooperation of the State Board of Health and the Ohio State University has been to move the offices of the former to Page Hall on the university campus. The laboratories are still located at the Hartman building but as soon as the botany building is vacated and remodeling completed, the laboratories will also be moved to the university. It is the intention of Dr. E. F. McCampbell, secretary and executive officer of the State Board of Health, to increase the facilities for popular education and for the education of health officers along public health lines. The educational facilities possessed by the university will be of great value in furthering this plan.

Dr. R. G. Paterson, formerly secretary of the Ohio Society for the Prevention of Tuberculosis, is now in charge of the division of tuberculosis and public health education in the State Board of Health and it is intended to make use of the university in furthering the work of this division. While it is true that the university will be of value to the State Board of Health, the latter will also be of value to the university.

Dr. Frank G. Boudreau, director of the division of communicable diseases, plans to place at the disposal of qualified medical students the facilities which his division possesses in the investigations and research work carried on by his department.

The secretary, Dr. E. F. McCampbell, who is also director of the hygienic laboratories, plans to begin the manufacture of vaccines and anti-toxins as soon as the laboratories are established at the university. This will be done in connection with the university laboratories and the veterinary department. The public health exhibit of the State Board of Health is now at Coshocton and will show at Uhrichville, East Liverpool, Bellaire, and other points in the northeastern portion of the state in the next two weeks. The exhibit was very successful at Newark and Zanesville and drew large numbers of sightseers daily. A lecture on public health is given each evening by one of the members of the staff of the State Board of Health. This lecture is illustrated with stereopticon slides and is followed by moving picture films on various subjects. The exhibit comprises photos, aphorisms, cartoons and models illustrating the prevention of tuberculosis, occupational diseases, communicable diseases and various phases of sanitary engineering work and other matters pertaining to sanitation. Improvements and new material have been constantly added to the exhibit and it has been modified in accordance with the effect produced upon various communities. The exhibit was shown before the Columbus Academy of Medicine and the conference of the State Board of Health with city health officers in January, 1914.

SCIENTIFIC NOTES AND NEWS

THE committee of the Lister memorial fund has commissioned Sir Thomas Brock, R.A., to execute a medallion portrait of the late Lord Lister, to be placed in Westminster Abbey.

SIR J. J. THOMSON has been elected president of the Physical Society of London.

PROFESSOR ERNST HAECKEL was ennobled on the occasion of his eightieth birthday.

DR. SIMON SCHWENDENER, professor of botany at Berlin, has celebrated his eighty-sixth birthday.

SURGEON-GENERAL GORGAS, on his return from his mission to South Africa, and his two companions, Dr. Darling and Major Noble, will be entertained at a complimentary dinner in London on March 23. The chair will be taken by Sir Thomas Barlow, president of the Royal College of Physicians, who will be supported by Sir Rickman Godlee, president of the Royal College of Surgeons; Sir Francis H. Champneys, president of the Royal Society of Medicine; Sir David Ferrier, president of the Medical Society of London; Sir Havelock Charles, president of the Society of Tropical Medicine and Hygiene; by the regius professors of medicine in Oxford and Cambridge, and by the directors of the medical services of the Royal Army and Navy.

We learn from the *Journal* of the American Medical Association that the Robert Koch Foundation at Berlin for Research on Tuberculosis has granted a subsidy of $500 to Professor Lexer, of Jena, for research on the action of light rays on tuberculosis tissue, and to Professor Kayserling, of Berlin, to carry on his roentgenologic investigation of the distribution and extent of infection in tuberculosis-ridden families.

The National Institute of Social Sciences presented gold medals of the Institute to Dr. Abraham Jacobi and Professor Henry Fairfield Osborn at the New York Academy of Medicine on March 20.

The Council of the Royal Astronomical Society has elected to honorary membership Miss Annie Cannon, of the staff of Harvard College Observatory.

Dr. Barton Warren Evermann has resigned the position of chief of the Alaska Fisheries Service, United States Bureau of Fisheries, and that of curator, division of fishes, United States National Museum, and has accepted the directorship of the museum of the California Academy of Sciences.

Dr. Raymond Foss Bacon has been appointed to succeed the late Dr. Duncan as director of the Mellon Institute for Industrial Research of the University of Pittsburgh. He was formerly associate director of the institute.

Lieut.-Col. Charles F. Mason has been appointed chief health officer of the Canal Zone, and Lieut.-Col. George D. Deshon superintendent of the Ancon Hospital.

Professor C. E.-A. Winslow, of the New York City College and the American Museum of Natural History, has been appointed advisory expert on public health education by the New York State Commission of Health.

Dr. Philip Adolph Kober has resigned as research chemist in the Harriman Research Laboratory of the Roosevelt Hospital, his resignation to take effect at the end of September.

Professor Löhnis, of the laboratory for agricultural bacteriology in the University of Leipzig, has accepted a call to a position in the Department of Agriculture at Washington.

Mr. J. Adams, assistant in botany in the Royal College of Science, Dublin, has been appointed to a position under the Canadian government.

Dr. Hans von Staff, docent for geology at Berlin, has been appointed geologist for German Southwest Africa.

At the recent meeting in Chicago of the Association of Medical Colleges, officers were elected as follows: *President,* Dr. Isadore Dyer, Tulane University; *Vice-president,* Dr. Charles R. Bardeen, University of Wisconsin; *Secretary-treasurer,* Dr. Fred. C. Zapffe, 3431 Lexington Street, Chicago; *Members Executive Council,* Dr. William J. Means, chairman, Ohio State University; Dr. Randolph Winslow, University of Maryland; Dr. Egbert Le Fevre, University and Bellevue Hospital Medical College; Dr. F. C. Waite, Western Reserve University, and Dr. E. P. Lyon, University of Minnesota.

Dr. David Starr Jordan has sailed from Italy for Australia, where he is giving a series of lectures. He will visit Ceylon, where he will make a collection of fishes and later expects to make a study of the results of the war in the Balkan States. He plans to reach California late in August.

President Harry Pratt Judson, of the University of Chicago, will go to China under the auspices of the Rockefeller Foundation of New York to examine and report on the situation there in regard to medicine, surgery and public health. The party will include also a medical expert. They will sail from New York on March 21, proceeding to Paris and thence to Moscow, arriving at Peking on April 19. President Judson will visit the principal places in China where work of the character in question is carried on. During the heat of the summer President and Mrs. Judson expect to spend some time in Japan, and early in the autumn they may go to southern China, sailing from Hongkong for San Francisco and stopping at Honolulu on the way. The investigations in China will occupy six months.

PROFESSOR D. C. MILLER, of the Case School of Applied Sciences, has given two lectures on sound at Cornell University. The first lecture, on "The Science of Musical Sounds," was given under the auspices of the College of Arts and Sciences; the second, on "The Physical Characteristics of Vowels," under the auspices of the Sigma Xi Society.

THE Washington Academy of Sciences held a joint meeting with the Chemical Society of Washington on March 16, when an address on "The Chemistry of Colloids" was given by Dr. Wolfgang Ostwald, of the University of Leipzig.

BEFORE the Geographic Society of Chicago on March 13 a lecture was given by Professor Henry J. Cox, in charge of the Chicago office of the United States Weather Bureau, on "Cranberry Bogs and the Cranberry Industry."

DR. W. W. CROSBY, Baltimore, delivered a lecture on February 28, before the students in highway engineering, Columbia University, on the subject of "Cost Data in Highway Engineering."

IN connection with an arrangement of exchange lectures with the Missouri School of Mines, the University of Kansas, the Iowa State College and the University of Wisconsin, Professor H. H. Stoek, of the department of mining engineering of the University of Illinois, has returned from giving a course of three lectures at Rolla, Missouri, Lawrence, Kansas and Ames, Iowa. The subjects of the lectures were the "Geography, Geology and Properties of Anthracite"; the "Mining and Preparation of Anthracite," and the "Sociological Features of the Anthracite Industry."

UNDER the auspices of the State Water Survey of the University of Illinois, the sixth annual meeting of the Illinois Water Supply Association held a three day's session March 9 to 11 in Urbana. Among the university men giving addresses were Director Edward Bartow, of the State Water Survey; Professor A. M. Talbot; Professor Otto Rahn and Dr. John A. Fairley. The latter spoke on "Public Control of Water Supplies in Illinois." Among the speakers from a distance were Mr. E. M. Chamot, of Cornell University; Mr. Wm. M. Booth, of Syracuse, N. Y.; Mr. Jay Craven, of Indianapolis; Mr. W. M. Cobleigh, of Montana State College, and Dr. A. J. McLaughlin, of Washington, D. C.

DR. EDWARD SINGLETON HOLDEN, astronomer and librarian of the United States Naval Academy, formerly director of the Lick Observatory, died on March 15, aged sixty-eight years.

SIR JOHN MURRAY, the eminent Scottish naturalist and oceanographer, was instantly killed in an automobile accident on March 16. He was born in Canada in 1841.

MR. GEORGE WESTINGHOUSE, the distinguished inventor and engineer, died on March 12, aged sixty-eight years.

DR. THOMAS MORGAN ROTCH, professor of pediatrics in the Harvard Medical School and well known for his publications on the diseases of children, died on March 9, aged sixty-five years.

MISS EDITH ETHEL BARNARD, Ph.D., instructor in chemistry at the University of Chicago, died on March 8.

DR. F. KORTE, a well-known physician of Berlin and father of the distinguished surgeon, has died at the age of ninety-six years.

THE death is also announced of Dr. August Pauly, associate professor of zoology at Munich.

THE U. S. Civil Service Commission announces an examination for assistant explosives engineer, on April 8, 1914, to fill a vacany in this position in the Bureau of Mines, at Pittsburgh, Pa., or at other places in the field, at salaries ranging from $1,620 to $2,100 a year, and also for an assistant drainage engineer, for both irrigated lands and humid regions, in the Office of Experiment Stations, Department of Agriculture, at salaries ranging from $1,000 to $1,500.

WE learn from *Nature* that by the will of the late Alderman H. Harrison, Blackburn, legacies amounting to £82,600 are bequeathed to public objects, among which are: £1,000 each to the Imperial Cancer Research Fund,

the Cancer Investigation Department of the Middlesex Hospital, and the Cancer Hospital for cancer investigation; £5,000 to Manchester University for general purposes, and £1,000 for the Chinese chair; £2,000 to Blackburn Grammar School for playfields, and £1,000 for university scholarships.

About thirty pictures of psychologists have been secured and reproduced for distribution by Professor E. A. Kirkpatrick, of Fitchburg, Mass., in accordance with the plan outlined in this journal some months ago.

Arrangements are in progress for a Meteorological Congress to be held in Venice in September and to which meteorologists of all countries are to be invited.

The Pasteur Institute of Paris has invited directors of similar institutes and antirabic services throughout the world to a conference on hydrophobia with special reference to etiology, prophylaxis, treatment and statistics. The conference will meet in the Pasteur Institute April 7 to 10, 1915.

Nature reports that the London School of Tropical Medicine has sent an expedition to China to study the mode of dissemination of human diseases caused by trematode parasites, especially bilharziosis, and the relation of such diseases to those occurring in domestic animals. Investigations into ankylostomiasis will also be carried on. The members of the expedition are Dr. R. T. Leiper, helminthologist of the Tropical School; Surgeon E. L. Atkinson, R.N., and Mr. Cherry-Garrard. The two last named were members of Scott's Antarctic Expedition, and the name of Surgeon Atkinson is familiar to the public as the leader of the search party which recovered the bodies of Capt. Scott and his companions.

UNIVERSITY AND EDUCATIONAL NEWS

An anonymous gift of $20,000 has been made to the library of Haverford College. The interest is to be used for the purchase of books on literature, history and art.

At the meeting of the Council on Medical Education of the American Medical Association, held in Chicago on February 24, the following colleges were given higher ratings: The University of Pittsburgh, School of Medicine; Jefferson Medical College, and the Starling-Ohio Medical College (now the College of Medicine of the Ohio State University) were raised from Class A to Class A+. The Atlanta Medical College, Atlanta, Ga., and the Fordham University School of Medicine, New York City, were raised from Class B to Class A.

At the regular meeting of the board of trustees of the University of Pennsylvania held March 9, it was decided that beginning with the session 1914–1915, all candidates for the degree doctor of public hygiene shall be required to have had identically the same preliminary education as that now demanded of those entering upon medical courses leading to the degree, doctor of medicine; that is to say, at least two years of college work plus the specified amount of physics, chemistry and biology as set forth in the University of Pennsylvania catalogue.

At Columbia University the following assistant professors have been promoted to the grade of associate professor, from July 1, 1914: Charles P. Berkey (geology); Bergen Davis (physics), and James H. McGregor (zoology). Instructors promoted to be assistant professors are as follows: Jean Broadhurst (biology—Teachers College); Clifford D. Carpenter (chemistry—Teachers College); Harold B. Keyes (physical education—Teachers College); Arthur C. Neish (chemistry); John M. Nelson (chemistry); Edward D. Thurston, Jr. (mechanical engineering); Harold W. Webb (physics); Mary T. Whitley (educational psychology—Teachers College), and Jesse F. Williams (physical education—Teachers College).

William J. Miller, Ph.D., professor of geology for the past nine years at Hamilton College, has been elected professor of geology at Smith College.

Mr. J. M. Wordie has been appointed demonstrator of petrology at the University of Cambridge.

DR. OTTO KLEMM, docent at Leipzig, has been appointed professor of psychology in Alberta University, Edmonton, Canada.

DR. KARL HESCHELER has been appointed professor of zoology and anatomy at Zurich, to succeed Professor A. Lang, who retires from active service.

PROFESSOR ALBERT BUSHNELL HART has been selected by the German government as Harvard exchange professor at the University of Berlin for the academic year 1914–15.

DISCUSSION AND CORRESPONDENCE

THE RELATIVE IMPORTANCE OF SULPHATES AND PHOSPHATES IN SOILS

IT has been demonstrated by a number of investigators[1] that the total sulphur content of soils is generally low, the amount usually not exceeding 1,000 pounds in an acre surface foot. Further, it has been shown that an equal mass of soil will contain quite as much and very often a greater quantity of phosphorus. Another fact of equal importance and which has been abundantly demonstrated is that the demands for sulphur by farm crops is not appreciably less than for phosphorus.

No one familiar with this subject would question the necessity of maintaining the supply of phosphorus in a soil, but only lately has attention been focused on the sulphur problem, placing that element in the same category with phosphorus as an element of low supply and an economic factor in crop production and permanent fertility.

On the basis of "total" analysis it appears certain that the amount of sulphur in our common soils is not larger than the phosphorus supply, and, further, that the amount brought to the surface annually in the rainfall will not compensate for the loss the land sustains by drainage.

Yet when we admit these facts we have only opened the problem of the necessity of sulphur fertilization. It is becoming rather common practise to attach a great deal of importance to the total quantity of any given essential plant food element in the soil, believing that this alone will measure or determine the permanent crop-yielding power of a given soil. For a measure of permanent crop production and for the knowledge upon which to build the soil to a certain plane of efficiency these determinations undoubtedly have value, but in the problem of continued fertilization too often we lose sight of the influence of the added material on the biological soil processes and the physiological balance of nutrients essential for the optimum growth of plants.

While it is admitted that the soil supply of sulphur is as low as the phosphorus supply, yet the question must be raised and answered—will sulphates influence crop production to the same extent as added phosphates?

It is apparent that part of the soil sulphur is in organic forms and part as sulphates, but that the organic forms are constantly being oxidized to sulphates. The additional fact that drainage waters are richer in sulphates than in phosphates must lead to the conclusion that the solubility of the sulphates in the soil water is much greater than the solubility of the phosphates. This being true, it is apparent that a lesser total quantity of sulphates in a soil would be as efficient in maintaining a sufficient sulphate concentration in the feeding zone of the plant as a much greater total quantity of phosphates.

In addition to the question of solubilities the important factor of the relative effects of sulphates and phosphates on the biochemical soil processes must be raised. Such important biochemical processes as ammonification, nitrification, nitrogen fixation, and the rate of decomposition of organic matter with its accompanying liberation of carbon dioxide can not be too greatly emphasized in deciding on the relative fertility of soils.

It has been demonstrated beyond question in certain phases of fermentology that cellular and enzymatic activities are markedly increased by the presence of soluble phosphates. Harden and Young have shown that the ac-

[1] Bogdanoff, Abstract Expt. Station Rec., 11, 723; Dymond, Hughes and Dupe, *Jr. Agr. Sci.*, 1905, 1–107; Hart and Peterson, Research Bull. No. 14, Wis. Exp. Station; Shedd, Bull. No. 174, Ky. Agr. Expt. Station.

tivity of the yeast cell or its zymase is greatly accelerated by the presence of these substances. The question then may properly be asked whether soluble phosphates do or do not accelerate the activity of the organisms or the enzymes responsible for those important soil processes mentioned above, and further whether sulphates effect in the same degree such accelerations.

Work in this and other laboratories has progressed far enough to indicate that soluble phosphates have a very material effect in increasing the number and consequently the rate of ammonification, nitrification, nitrogen fixation, and carbon dioxide output of those soil organisms capable of carrying out these processes, while sulphates do not, at least in the same degree, accelerate their multiplication. My thanks are due Professor C. Hoffmann for conducting such experiments.

From such results it is evident that sulphates will not be of the same importance in increasing crop production as can be expected from the phosphates. An adequate supply of sulphates is, of course, necessary, and for those crops making an abundant use of sulphur, such as the high protein plants and the members of the Cruciferæ, a further concentration in sulphates of the soil water may often result in increased crop production. But to the phosphates must be ascribed functions additional to that of merely maintaining a certain concentration of phosphorus in the soil solution—namely, the important function of greatly accelerating the biological activities of the soil.

In conclusion, however, it should be emphasized that as crop production per unit of area increases through the extended use of added phosphorus and attention to proper soil reaction, there will result an increased demand for sulphur.

E. B. Hart
University of Wisconsin

GRIZZLY BEARS: SKULLS WANTED

Half a century ago a considerable number of wholly distinct species of grizzly bears inhabited the western part of North America. They ranged from the eastern edge of the Great Plains in Manitoba and the Dakotas westerly to the Pacific coast in British Columbia and California, and from the shores of the Arctic ocean south into Mexico. The species inhabiting Alaska and the western provinces of Canada, though reduced in numbers, may still be counted among the living, but those of the western United States are with few exceptions extinct; and what is still worse, in most cases only a few skulls remain to afford future students a fragmentary and imperfect picture of the great carnivores which not long ago were dominant figures in our wild life.

For twenty-three years I have been engaged in a study of the bears, and have been favored with specimens (mainly skulls) from nearly all the museums and private collections of the United States and Canada. Still, owing to wide gaps in this material, many questions have arisen which can not be answered. Not only is it impossible to map the ranges of the different species with anything like precision, but in some cases, owing to the absence of skulls of adult males, the characters which serve to distinguish one species from another can be determined only in part.

Therefore, in the hope of obtaining more light on some of these questions before going to press, I wish to make a final appeal to all who have skulls of grizzlies in their possession. I am anxious to see as many skulls as possible of both sexes from all parts of the western United States, British Columbia, Alberta, Manitoba, Yukon Territory and Alaska, and would like to purchase or borrow all that I have not already seen. Owners of skulls will confer a favor by addressing

C. Hart Merriam
National Museum,
Washington, D. C.

QUOTATIONS

THE PARTICIPATION OF UNIVERSITY PROFESSORS IN POLITICS [1]

My dear President McVey: I regret to advise you that I find myself out of harmony

[1] Correspondence between the professor of law and the president of the University of North Dakota.

with the university administration on the question of academic freedom, which I regard as fundamental; and I therefore tender my resignation as professor of law, to become effective at the end of the present academic year, that is to say, in June, 1914.

When I joined the faculty here a year ago last September, it never occurred to me that restraints would be imposed upon my freedom of action in public affairs. Indeed, it was represented that public life presented an attractive avenue to the professor in North Dakota.

Last year I made several speeches during the presidential campaign and induced two of my colleagues to do likewise. After the election, much to my surprise and chagrin, you objected to what we had done. In the interview that you granted my associates and myself, you first took the position that members of the faculty must not take part in national and state politics, although they might participate in municipal politics. I suggested that my resignation was ready, if you spoke advisedly. You asked me not to resign. The interview was terminated with the understanding that you personally were opposed to professors having anything to do with politics, except municipal, but left it to each man to determine his own course.

In October of the present year, at the request of the local leaders, I attended a statewide Progressive conference at Fargo. The gathering was informal, not open to the public, and for purpose of organization. A few days after the meeting, I was advised by the dean of the law school that you had told him that Judge Young, one of the university trustees, had objected to my participation in the conference, taking the position that members of the faculty must keep out of politics, on penalty of dismissal. I was further informed that his position represented the policy of the administration and this has since been confirmed.

It scarcely is necessary for me to observe that I regard such a policy unjust to the faculty and the institution; and I am satisfied that a professor could not legally be removed for exercising the prerogative of citizenship. Under the circumstances, if I were to remain here, I should be compelled either to engage in an unseemly and distasteful wrangle with the administration or to sacrifice the rights and be recreant to the duties of citizenship. Neither course commends itself to me.

In my humble judgment, it will be a sorry day for American education, if the policy of suppression adopted here ever becomes general. One can not, it seems to me, reach his full development, either as a teacher, a citizen or a man, unless he retains normal relations with life. Without this a university professor, no matter how strong his intellect or profound his learning, must become—like the image of Nebuchadnezzar—possessed of a gold head, but feet of clay.

As a last word, may I say that my disposition toward you personally is cordial, and I do not hold you responsible for the policy with which I take issue so squarely. I respect your scholarship and your talent as an administrator, and trust that our relations may remain friendly. All of which is respectfully submitted. Sincerely yours,

JOSEPH L. LEWINSOHN

My dear Professor Lewinsohn: I have your letter in which you indicate your intention of resigning at the end of the year. I shall present the resignation to the board of trustees at their next meeting for their action. I respect your point of view, though I do not agree with it, and wish you to understand that there is no personal feeling in the matter, so far as I am concerned, and that our relations will remain cordial.

I wish, however, to say that in my opinion you are wrong. We have been insisting for some time the judges of the court shall remain out of politics and have put them upon nonpartisan tickets, and it is no longer good form for a judge to take the stump in a political election. To my mind, a professor in a state university occupies much the same position. with even more emphasis upon the necessity of his remaining in a judicial position than in the case of a judge of the state court. I do not want my boy taught political economy, for instance, with a Democratic or Republican

bias, and just as soon as I enter politics I begin to act as a partisan and I lose my place as a judge and an unbiased individual. As soon as a professor enters politics he makes the university an object of political purpose. This is so for the reason that the political activity may be utilized and places gained through political control.

As politics go, you can not escape their consequences, and to develop a theory about academic freedom that you can escape them, and still take part in them, is entirely beside the mark. There is no restriction placed upon the teaching of a professor, or upon his speaking upon social and economic questions, but as soon as he allies himself with a political body which seeks to control the political power of the state, there is danger. The life of the universities in this state and elsewhere depends upon their being able to keep above this kind of politics, the kind that you want to engage in. Professor Ross, of the University of Wisconsin, put it in this way: "We (meaning professors) ought to be willing to give over the forum to the politicians for a period of six weeks, when we have it all the rest of the year."

I do not acquiesce at all in your view that the educational life of the universities and of the state is endangered by this attitude. To my mind, it is good sense and good policy.

With best wishes for your success, I remain,

Yours very truly,

Frank L. McVey,
President

SCIENTIFIC BOOKS

Objektive Psychologie. By W. von Bechterew. Authorized translation. Leipzig and Berlin: Teubner. 1913. Pp. viii + 468. 16 Mks. unbound, 18 Mks. bound.

The study of animal behavior is developing a tendency among certain psychologists to emphasize motor expression as a research method in human psychology. Professor Max Meyer's "Laws of Human Behavior" is typical of this trend, though it shows the influence of traditional psychology in many respects. Other American writers are leaning in the same direction, and Professor J. B. Watson has recently thrown down the gauntlet by proclaiming boldly that behavior is the one fruitful method of psychological investigation, and that the study of consciousness is unscientific and barren.

In his "Objective Psychology" Professor Bechterew attempts a systematic development of psychology according to the behavior method. He does not expressly reject introspective psychology, but proposes to eliminate it from the present work. Starting with the concept of the neuropsychic reflex he aims to describe the whole mental life of man in terms of expression, discarding entirely conscious phenomena, such as sensation, feeling and thought. He calls this science objective psychology or psychoreflexology. A better English equivalent is behaviorism or behavior psychology. Considering the newness of the field, Bechterew's attempt is fairly successful. He has outlined systematically and with remarkable completeness the various aspects of human mental life as they are manifested in every sort of objective expression.

A distinction is made at the outset between purely nervous processes and neuropsychic processes. The former depend solely on present stimuli and inherited nervous mechanisms; the latter are modified by past individual experience (pp. 16, 22, 24). Every impression "leaves in the nerve centers a certain trace which under certain circumstances can be reexperienced and thereupon appears as an associative or psychic reflex" (105). Impressions or stimuli are classed as external (that is, from peripheral sense organs) and internal (organic, etc.); the resulting expressions are either movements, vasomotor activity, or secretion (164). Responses to external stimuli are termed reflexes, those due to internal stimulation are called automatic movements (165), though the distinction is not always sharply marked (166).

Reactions of every type have become organized into complex "acts" by means of special nervous mechanisms aided by the traces of former impressions. Thus an external stimulus may give rise to a complex act such as

walking, through the association of a series of movements whose stimuli have previously accompanied the same stimulus (180). In the formation of such associations inhibition plays an important rôle. Bechterew defines instinct as a complex movement or act which follows *internal* stimulation and results in satisfying some organic need or protecting the organism from harmful or disturbing influences (188). In contrast with instinct, imitation and the circular reflex are based on associations which modify the responses to *external* stimuli.

The complex reflexes which involve association find expression in all three motor modes (movement, vasomotor activity and secretion) and may be investigated in several ways. The author prefers his own method, that of motor association reflexes, to Pawlow's salivary method (262). Considerable space is devoted to an analysis of emotional expression, which he calls mimicry. Bechterew holds that these reflexes have more than a phylogenetic value; they perform an important function in the given reaction itself (327).

The last part of the book examines three specialized forms of complex response, the concentration reflex, symbolic reflex and personal reflex. The concentration reflex is the behavior analogue of attention, and one has no difficulty in identifying the symbolic reflex with language. The discussion of vocal language is thorough, but the treatment of gesture and writing is disappointingly brief. One is surprised that the analysis of sensation and perception, or rather sensory and discriminatory responses, is taken up in connection with symbolic reflexes. It is true that sensation as such can not be brought into the behavior psychology. It can only be investigated by means of responses on the part of an observed organism; and the quantitative measure of sensation in man according to our classic laboratory methods usually involves verbal reactions. Nevertheless this holding back of the discussion of elementary phenomena in a systematic treatise will strike most psychologists as a defect in the objective method itself. It is but fair, however, to point out that the introspective psychology of our fathers relegated elementary *motor* phenomena to the footman's seat in much the same way.

The analysis of personality from an objective standpoint will arouse special interest and is likely to become the focus of criticism. Bechterew holds that "the personal sphere represents the totality of traces from organic associative reflexes, around which a part of the reflexes aroused by external stimuli group themselves by association" (431). These organic traces are experienced in connection with every change of general bodily condition; their sum total forms the "inner kernel of the Neuropsyche" (432).

"Personal reactions are termed *acts* and *deeds*" (435). They are distinguished from other reactions, not by the character of the external stimuli, but by the relation of the present stimuli to the individual's past history. The hunter is aroused to action by the flight of a game bird, which is quite unnoticed by the man with no sporting proclivities. The same stimulus may even affect the same individual differently at different times. Personality in this objective sense guides all our lower activities. Concentration (attention) and the selection of association traces are thus in part determined internally; this is Bechterew's substitute for the free-will experience of subjective psychology. Of interest is his application of muscular work and fatigue to the investigation of personality. Believing that muscular fatigue is due to impairment of both muscle and nerve centers, Bechterew considers that the ergographic curve furnishes a measure of individual efficiency. It is to be regretted that the analysis of personality is not so detailed as the rest of the work.

Bechterew's book is the most consistent attempt at a thorough-going objective psychology so far made. It may be questioned, however, whether he has succeeded in banishing subjective psychology altogether from his pages. In many places affective and emotional terms are used to characterize the basis of reaction. This is especially noticeable in his analysis of hedonic states (107–123), internal reflexes (171–175), and emotional expression

(278 ff.). To be sure these terms are usually set off in quotation marks like the pseudonyms of notorious criminals. In many cases it is only fair to interpret them as a shorthand symbol for a physiological condition. But it does not seem legitimate to distinguish between various sorts of reaction on the basis of subjective conceptions (such as joy and sadness, p. 60, anxiety, dissatisfaction, etc., p. 111) unless some clear physiological differentiæ of these hedonic states have first been determined. This the author often neglects to do. He gives physiological *descriptions* rather than physiological *definitions* of these terms; even when he substitutes the terms *sthenic* and *asthenic* for pleasure and pain his criterion is apparently subjective. It is scarcely fair to repudiate subjective psychology, and at the same time to employ subjective hedonic data to differentiate between various modes of reaction.

The book needs considerable condensation. Too much space is devoted to details of particular laboratory experiments, which could be summed up in a few sentences with proper references. The German translation is satisfactory except in the transliteration of proper names from the Russian alphabet. The names of several well-known writers are inexcusably misspelled; for example, Dadge (for Dodge), Fallerton (Fullerton), Merrillier (Mariller), Burdon (Bourdon) and Hawding (Höffding). In one place the values of the time threshold are given in seconds instead of thousandths (422).

It is clearly too soon to attempt an estimate of such a new departure from beaten paths as this work affords. The contemporary "subjective" psychologist of whatever type is not yet sufficiently grounded in behaviorism to evaluate its merits. But however critical of the objective standpoint the reader may be, he will find Bechterew's book worth a very careful study.

Howard C. Warren
Princeton University

The Fisheries of the Province of Quebec. Part 1. Historical Introduction. By E. T. D. Chambers. (Published by the Department of Colonization, Mines and Fisheries of the Province of Quebec.)

To any one interested in the history of Canada and the historical development of what was its first and long its chief industry (and would be still were it not for the demand of the newspapers on the Canadian forests), Mr. Chambers's work is fascinating. The author has brought together, from whatever source and with infinite pains, abundant excerpts from ancient relations, with ancient illustrations and contemporary portraiture bearing upon the historic pursuit of the cod and its confreres in the Quebec waters. The golden cod on the Boston State House emblazons a fact that is easily and rather wittingly forgotten: that the *Mayflower* colonists and their successors came to that rock-bound coast to worship God in their own way; but "So God have my soul," said the High and Mighty Prince James, when the Leyden agents of the Puritans told him they were to go to "Virginia" for the *fishing*, "'tis an honest trade; 'twas the Apostles' own calling." So they came to fish for cod as well as to worship in their chosen way, while the sturdy Bretons and Normans who had reached the Quebec coast long years before came simply to fish for cod.

There is romance of history in the Quebec fishing, for it is "more than four hundred years since Basque and Breton fishermen gathered the first harvest of the sea from the waters that wash the coasts of Labrador and Gaspé." Cartier, penetrating the straits of Belleisle into the Gulf in 1534, met a Norman fisher; and after his day, as soon as the wealth of the new French waters became known at home, the men of St. Malo, Honfleur and the Biscayan ports flocked to these shores in great numbers. Even after the conquest the Quebec fishing remained French; while the fishing masters came out from the Channel islands and their descendants to-day still control the industry.

In giving the descriptive records of ancient procedures, Mr. Chambers has assembled a really large part of the active industrial history of maritime Quebec during its romantic

period, for history was in the making in these turbulent waters and along these sequestered shores long before the Gloucesterman was conceived. The purpose of this notice is not to direct attention to the scientific analysis of the fishing business, into which it does not purport to enter, but to applaud the worth and fitness of this contribution to the historic development of the oldest known industry on the North American continent and to congratulate the author on the attractive manner in which he has presented his subject. As an official document it bears the cachet of dignity and the assurance of durability.

JOHN M. CLARKE

NOTES ON METEOROLOGY AND CLIMATOLOGY

CLIMATOLOGY AT THE ASSOCIATION OF AMERICAN GEOGRAPHERS

AT the tenth annual meeting of the Association of American Geographers at Princeton, N. J., January 1 and 2, 1914, six climatological papers were presented:

The Weather Element in American Climates: R. DEC. WARD.

Since American climates are chiefly made of cyclonic weather, this factor is all-important; the actual conditions affect us and not the averages. Winter is a cyclonically-controlled period—at this time of year practically the whole country is covered with cyclonic paths. In summer, solar control is uppermost, the cyclone paths are in the north and the cyclones weak. Thus cyclone paths migrate with the sun. As the distribution of meteorological elements in a cyclone is different in different parts of the country, Professor Ward is preparing regional cyclonic weather types for the United States.

The Frostless Period in Maryland and Delaware: OLIVER L. FASSIG.

The number of days (average of 20 years) between the last severe frost or freezing temperature in the spring and the first in the fall ranges from 130 days in the west to over 200 days in the immediate vicinity of Chesapeake Bay. For further study of plant growth as related to climatic conditions, phenological observations of similar plants in the same soil (transported) are to be undertaken at many points, each group being visited every 10 or 15 days.

Storm Frequency in the United States and Europe: C. J. KULLMER.

A geographical study of cyclone frequency of the United States 1874 to 1891 and of Europe 1876 to 1891 shows irregular or perhaps periodic latitude variations of cyclone frequency. An attempt was made to correlate these latitudinal changes with the eleven-year periodical latitude change of sun-spot belts. Such changes of cyclone frequency are probably accompanied by rainfall and temperature variations.

The Pleionian Variations of Temperature: HENRY ARCTOWSKI.

Swings of temperature covering a year or more seem to be the result of periodic fluctuations in the solar constant plus variations caused by volcanic dust in the atmosphere. This coincides with the results obtained by Abbot and Fowle and many others.

Climate and Human Efficiency: ELLSWORTH HUNTINGTON.

From a study of the piece-work wages of 270 operatives in some Connecticut factories, 1910–1912, it was found that their maximum efficiency came in December with a secondary maximum in May. The minimum of about 85 per cent. of the maximum came in January and another of about 90 per cent. in August. Highest efficiency usually occurred with out-of-door temperatures near 58° (F.), and with wide variations of temperature from one day to the next. Other meteorological elements considered individually in this connection gave no satisfactory results. Further work will be done to compare mental efficiency with weather.

The Snowfall About the Great Lakes: CHARLES F. BROOKS.

The snowfall in this region is heavy because of much moisture precipitated at low temperatures by the many winter cyclones. On account of the cooling action of land on the prevailing west winds blowing across the lakes, the east shores get more snow than the

west. Ice on the lakes by diminishing evaporation reduces the snowfall of the leeward shores. Thus the heaviest snowfall comes early in winter on the east shores in marked contrast with the late winter maximum on the west shores.

THERMOMETER EXPOSURE

Dr. W. Köppen in the *Meteorologische Zeitschrift*, October and November, 1913,[1] has presented the results of a long study of thermometer exposure in different parts of the world with many shelters. His results are briefly stated below. To determine air temperature the thermometer must be sheltered from radiation but not from the air; the air must not travel far between radiators before reaching the thermometer, and the shelter must have low specific heat and be a poor conductor. The English (Stevenson) shelter in the small form of 1883 fulfills the above stipulations very well. But to eliminate the effect of heating by the sun and excessive cooling at night, a screen is necessary. Dr. Köppen proposes a small and simple screen of grass, rushes, brush or palm leaves to be set over the shelter in such a way as to exclude sunlight when the sun is more than 20 degrees above the horizon. The roof of the shelter should be of this material also. As the small Stevenson shelter is too small for the ordinary thermograph and hygrograph, a combined instrument is suggested instead. Since the English shelter is extensively used, these modifications proposed by Dr. Köppen to obtain strictly comparable temperature data can be made with facility.

CHANGES OF CLIMATE

Professor J. W. Gregory, of Great Britain, presented a paper entitled "Is the Earth Drying Up?" before the Royal Geographical Society, December 8, 1913.[2] Of the three general views in this matter, the first (Prince Kropotkin) maintains that the earth has a general tendency towards drought; the second (Professor Ellsworth Huntington) that while there is this general drying the more important changes are pulsatory, and the third (Mr. R. Thirlmere) that climate varies in cycles of 2,000 years or more and that we are now cooling. Professor Gregory put the evidence from different countries on a map. The result shows probable desiccation in historic times in Central Asia, Arabia, Mexico and South America; but increased rainfall in the United States of America, Greenland, Sweden, Roumania and Nigeria. There seems to have been no appreciable change in Palestine, North Africa, China, Australia and by the Caspian Sea. Thus while there seem to have been local variations there has been probably no general change in climate in the historic past. At any rate, no great universal change could be expected without a considerable change in land and water distribution or of the intensity of solar radiation.

AIR MOVEMENT IN THE CIRRUS LEVEL

The geophysical institute of the University of Leipzig has recently issued a work by Th. Hesselberg, "Die Luftbewegungen im Cirrusniveau."[3] From comparison of the tracks of cyclones and anticyclones with the stream lines shown from cirrus observations, the following results have been obtained. Cyclones and moving anticyclones move in the same directions as the air in the cirrus level over the center. The velocity of movement of cyclones and anticyclones is in the mean 0.2 to 0.4 of the velocity of air in the cirrus level. The relative velocity is smaller the deeper the minimum and the higher the maximum.

Air movement in the cirrus level seems to be controlled by the pressure and temperature conditions on the earth. The more intense the cyclone or anticyclone and the smaller the horizontal temperature gradient the greater is its effect on the currents above. The disturbance which a cyclone makes on the cirrus path

[1] "Einheitliche Thermometeraufstellung für meteorologische Stationen zur Bestimmung der Lufttemperatur und Luftfeuchtigkeit," pp. 474–487, 513–523, 1 plate.

[2] Review by "E. G.," *Nature*, London, December 11, 1913, p. 435.

[3] Second Series, Vol. 2, 73 pp., 48 maps, Leipzig, 1913.

works back onto the track of the cyclone. Thus a cyclone may have loops in its path.

JOURNAL OF THE SCOTTISH METEOROLOGICAL SOCIETY

THE annual volume (Vol. XVI., 3d Series, XXX.) of this society including rainfall returns and meteorology of Scotland for 1912 has recently appeared. There are seven special articles. Agricultural meteorology is touched in three—Dr. W. N. Shaw, "On Seasons and Crops in the East of England" (pp. 179–183), A. Watt, "On the Correlation of Weather and Crops in the East of Scotland" (pp. 184–187), and Dr. H. N. J. Miller, "The Composition of Rain Water Collected in the Hebrides and in Iceland, with Special Reference to the Amount of Nitrogen as Ammonia and as Nitrates" (pp. 141–158). Dr. Shaw has another article, "Upper Air Calculus and the British Soundings during the International Week (May 5–10, 1913)" (pp. 167–178). The other papers are—M. M'C. Fairgrieve, "A Possible Two-hourly Period in the Diurnal Variation of the Barometer" (pp. 158–166), Dr. E. M. Wedderburn, "On the Appearance of the Surface of Freshwater Lochs in Calm Weather" (pp. 189–193), and Dr. G. A. Carse, "Note on Atmospheric Electric Potential Results at Edinburgh during 1912" (pp. 188–189).

NOTES

ON January 1, 1914, the United States Weather Bureau began to issue daily weather maps of the Northern Hemisphere with pressures indicated in millibars and temperatures in Absolute Centigrade degrees. This map is printed on the back of the usual Washington weather map of the United States.

THE Central Meteorological Bureau of France has created a special forecast service for aeronauts.

MR. R. C. MOSSMAN, of the Argentine Weather Service, is acting editor of *Symons's Meteorological Magazine* and director of the British Rainfall Association during the temporary absence of Dr. H. R. Mill on account of ill-health.

THE Italian Meteorological Society will hold an international congress in Venice in September, 1914. The higher atmosphere, climatology, aerology, meteorology and maritime meteorology will receive particular attention.

IN connection with studies of air currents, pilot balloons are used extensively in Germany. Vertical currents are determined by comparing the observed rate of ascent of the balloons with the theoretical. The turbulent meeting planes of opposing vertical currents are usually marked by clouds.[4]

THE daily synchronous weather charts of the southern part of the Southern Hemisphere, October 1, 1901, to March 31, 1904, compiled from the observations of ships and the numerous Antarctic expeditions give the first extensive (though general) information concerning the cyclones of the south temperate and sub-antarctic zones. The paths of these cyclones lie far south, particularly in summer, when they are beyond latitude 60 degrees. The average rate of progression is about 20 kilometers per hour—about the same as ocean cyclones elsewhere.[5]

CHARLES F. BROOKS
HARVARD UNIVERSITY

SPECIAL ARTICLES

THE SYSTEMATIC POSITION OF THE ORGANISM OF THE COMMON POTATO SCAB

SCAB is probably the most widely distributed disease of the potato tuber. We are indebted to Professor Roland Thaxter for associating a specific organism with the cause of this disease. His description of the morphological and biological characters of this organism are so careful and his substantiation of the same as causal agent, so conclusive, that we are unable to add anything of material importance—at any rate here—from our own study of the organism.

Professor Thaxter named the organism *Oospora scabies*[1] by which "provisional"

[4] Dr. A. Peppler, *Deutsche Luftfahrer Zeitschrift*, November 26, 1913, pp. 578–580.

[5] See *Nature*, London, December 4, 1913, pp. 393–395.

name the disease organism has since been known. "Provisional" because Thaxter himself expresses his doubt as to the correctness of referring the organism to the genius *Oospora,* remarking that the genus *Oospora* as given by Saccardo has no scientific value.

We had occasion to carefully study this organism recently, and from our observations desire to rectify the nomenclature.

From Saccardo's interpretation of the genus *Oospora,* and from its numerous species, we must consider it as a fungus pure and simple, a hyphomycete of the Mucidineæ-Amerosporæ. The organism of potato scab proves not to be a fungus. It differs in morphological characters considerably from what is our present conception of an *Oospora.* Mr. G. C. Cunningham at the meeting of the American Association for the Advancement of Science in Washington, D. C. (1911), expressed his opinion that the potato-scab organism belongs to the "higher bacteria" and he proposes to place it in the genus *Streptothrix.* We are also inclined to regard it as a Schizomycete of the filamentous kind, belonging to the Chlamydobacteriaceæ. On endeavoring to place the organism in its proper genus, we found ourselves confronted by one of the most perplexing problems of botanical nomenclature, which promises a rich harvest to those who are fond of such study.

At first we considered *Streptothrix* Cohn[2] the correct genus, but found later that Corda[3] in 1839 founded this genus for another hyphomycetous fungus of which *S. fusca* was his species. Hence, according to the Vienna rules, this name was no longer available for another plant genus. Saccardo still considers this name as given by Corda valid, including four species all of which are distinct from our organism. Furthermore, *Streptothrix,* as erroneously used by Cohn, possesses no "sheaths," whereas our organism does, however delicate they may appear.

[1] Ann. Rep. Conn. Exp. Station for 1891, p. 153.

[2] *Beiträge zur Biol. d. Pflanzen,* Heft 3, pp. 186 and 202.

[3] "Prachtflora europ. Schimmelpilze," p. 23.

Other names such as *Cladothrix, Nocardia* and *Actinomyces* have also been loosely used for members closely related to the organism of potato scab. *Cladothrix* is out of the question owing to its false branching and ciliate spores.

Actinomyces was established by Harz in 1878[4] and his description undoubtedly shows generic relationship to our organism. Harz describes *A. bovis* as causing "lump jaw" or actinomycosis.

Homer Wright, M.D.,[5] pleads in favor of the name *Actinomyces* for use only in connection with the organism causing actinomycosis, and suggests that all other organisms of this genus should be known as *Nocardia* "because the use of the generic term *Actinomyces* for them logically leads to giving the name actinomycosis to those cases of suppurative processes due to infection with certain members of the group." This point of view is opposed to even the most elementary conception of botanical nomenclature.

Now *Nocardia* is the name at present in use by Saccardo for members of our group of organisms.[6] It was established by Trevisan in 1889; "he considered the generic name *Actinomyces* untenable because the generic name *Actinomyce* (without the terminal 's') was given by Meyen in 1827 to a fungus (*Hydrotremellinæ* (*Carus*)) described by him (*'Actinomyce Horkelii'*)."[7] According to Article 57 of the International Rules of Vienna, it is distinctly laid down that two generic names, even though differing by one letter only, are to be regarded as distinct, which applies in this case.

Hence *Nocardia* Trev. is untenable and *Actinomyces* Harz must stand for these organisms. The organism of potato scab properly belongs to this genus; in consequence I feel justified in correcting the nomenclature as follows:

[4] *Jahresb. Münchener Central Tierarzneischule.*

[5] *Journal Med. Res.,* Vol. VIII., May, 1905, No. 4.

[6] Saccardo, "Sylloge, etc." VIII., p. 927.

[7] Linnæa, Vol. 2, pp. 433.

Actinomyces scabies (Thaxter) Guessow = *Oospora scabies*, Thaxter.

At the same time I shall rectify the genus and species as far as given by Saccardo under *Nocardia* as follows:

Actinomyces Harz 1878 = Streptothrix Cohn 1875; Rossi Doria 1891 = Bacterium Afanasiev 1888 = Oospora Sauvageau et Radis 1892; Thaxter 1891 = Discomyces Rivolta 1878; R. Blanchard 1900 = Nocardia de Toni et Trevisan 1889; R. Blanchard 1900 = Actinomyces Gasperini 1894 = Actinomyce Meyen 1827 = Cladothrix Macé 1897.

Actinomyces farcinica (Trev.) Guessow = *Nocardia farcinica* Trev.

Actinomyces bovis (Harz) Guessow = *Nocardia Actinomyces* Trev.

Actinomyces Foersteri (Cohn) Guessow = *Nocardia Foersteri* (Cohn) Trev.

Actinomyces arborescens (Edingt.) Guessow = *Nocardia arborescens* (Edingt.) Trev.

Actinomyces ferruginea (Trev.) Guessow = *Nocardia ferruginea* Trev.

H. T. Güssow

DIVISION OF BOTANY,
EXPERIMENTAL FARMS,
OTTAWA, CANADA

THE AMERICAN SOCIETY OF ZOOLOGISTS

THE Central and Eastern Branches of The American Society of Zoologists met in joint session at the University of Pennsylvania, Philadelphia, December 29, 1913, to January 1, 1914, inclusive, in conjunction with The American Society of Naturalists, The American Society of Anatomists and the Federation of American Societies for Experimental Biology.

At the meeting for business, held during the afternoon of December 30, the following persons were elected to membership in the society:

CENTRAL BRANCH

James Edward Ackert, Kansas State Agricultural College, Manhattan, Kan.
Robert Chambers, University of Cincinnati, Cincinnati, Ohio.
John Morton Elrod, Missoula, Montana.
E. H. Harper, Northwestern University, Evanston, Ill.
Frederick Isely, Central College, Fayette, Mo.
Ruth Marshall, Rockford College, Rockford, Ill.
H. L. Wieman, University of Cincinnati, Cincinnati, Ohio.

EASTERN BRANCH

Gardiner C. Bassett, Carnegie Station for Experimental Evolution, Long Island, N. Y.
Raymond Binford, Guilford College, North Carolina.
Maynie R. Curtis, Agricultural Experiment Station, Orono, Me.
Hubert Dana Goodale, Amherst College, Amherst, Mass.
B. H. Grave, Knox College, Galesburg, Ill.
Emily Ray Gregory, Buchtel College, Akron, Ohio.
Louise Hoyt Gregory, Barnard College, New York.
George Lester Kite, Wistar Institute, Philadelphia.
C. C. Little, Harvard College, Cambridge, Mass.
E. Carlton McDowell, Yale University, New Haven, Conn.
Norman Eugene McIndoo, Bureau of Entomology, Washington.
Edith M. Patch, University of Maine, Orono, Me.
Alice Robertson, Wellesley College, Wellesley, Mass.

The "committee on organization and policy," appointed at the meeting held at Princeton in 1911, submitted its report in the form of a new constitution, the text of which had been printed and distributed to all members of the society several days prior to the meeting. This proposed constitution was considered section by section and, with certain amendments, was unanimously adopted. In its adopted form, it is as follows:

THE AMERICAN SOCIETY OF ZOOLOGISTS' CONSTITUTION

Article I

Name and Object

Sec. 1. The society shall be called the American Society of Zoologists.

Sec. 2. The object of the society shall be the association of workers in the field of zoology for the presentation and discussion of new or important facts and problems in that science and for the adoption of such measures as shall tend to the advancement of zoological investigation in this country.

Article II

Membership

Sec. 1. Members of the society shall be elected from persons who are active workers in the field of zoology and who have contributed to the advancement of that science.

Sec. 2. Election to membership in the society shall be upon recommendation of the executive committee.

Sec. 3. Each member shall pay to the treasurer an annual assessment as determined by the society. This assessment shall be considered due at the annual meeting and the name of any member two years in arrears for annual assessments shall be erased from the list of members of the society; and no such persons shall be restored to membership unless his arrearages shall have been paid or he shall have been reelected.

Article III

Officers

Sec. 1. The officers of the society shall be a president, a vice-president, a secretary-treasurer, and the members at large of the executive committee.

Sec. 2. The executive committee shall consist of the president, the vice-president, the secretary-treasurer and five members elected from the society at large. Of these five members, one shall be elected each year to serve five years. If any member at large shall be elected to any other office, a member at large shall be elected at once to serve out the remainder of his term.

Sec. 3. These officers shall be elected by ballot at the annual meeting of the society, and their official terms shall commence with the close of the annual meeting, except that the secretary-treasurer shall be elected triennially and shall serve for three years.

Sec. 4. The officers named in section 1 shall discharge the duties usually assigned to their respective officers.

Sec. 5. Vacancies in the board of officers, occurring from any cause, may be filled by election by ballot at any meeting of the society. A vacancy in the secretary-treasurership occurring in the interval of the meetings of the society may be filled by appointment until the next annual meeting by the executive committee.

Sec. 6. At the annual meeting the president shall name a nominating committee of three members. This committee shall make its nominations to the secretary not less than one month before the next annual meeting. It shall be the duty of the secretary to mail the list of nominations to all members of the society at least two weeks before the annual meeting. Additional nominations for any office may be made in writing to the secretary by any five members at any time previous to balloting.

Article IV

Meetings of the Society

Sec. 1. Unless previously determined by the society the time and place of the annual meeting of the society shall be determined by its executive committee. Special meetings may be called and arranged for by the executive committee. Notices of such meetings shall be mailed to all members of the society at least two weeks before the date set for the meeting.

Sec. 2. Sections of the society may be organized in any locality by not less than ten members, for the purpose of holding meetings for the presentation of scientific papers. Such sections shall have the right to elect their own officers and also associate members; provided, however, that associate membership in any section shall not confer membership in the society.

Article V

Quorum

Twenty five members shall constitute a quorum of the society, and four a quorum of its executive committee.

Article VI

Changes in the Constitution

Amendments to this constitution may be adopted at any meeting of the society by a two thirds vote of the members present, upon the following conditions:

(*a*) The proposed amendment must be in writing and signed by at least five members of the society.

(*b*) This signed proposal must be in the hands of the secretary at least one month before the meeting of the society at which it is to be considered.

(*c*) The secretary shall mail copies of the proposed amendment to the members of the society at least two weeks before the meeting.

By-laws

A set of by-laws, for the guidance of officers of the society in the performance of their duties, was also adopted in substance, but the work of embodying the same in appropriate and clear phraseology was delegated to the executive committee.

Officers of the society for the year 1914, as provided by the new constitution, were elected as follows:

President—C. E. McClung, University of Pennsylvania.

Vice-president—M. F. Guyer, University of Wisconsin.

Secretary-treasurer—Caswell Grave, Johns Hopkins University.

Additional Members, Executive Committee—To serve *one* year, H. E. Jordan, University of Virginia; to serve *two* years, H. F. Nachtrieb, University of Minnesota; to serve *three* years, H. V. Wilson, University of North Carolina; to serve *four* years, George Lefevre, University of Missouri; to serve *five* years, A. F. Shull, University of Michigan.

The treasurers of the Central and Eastern branches made financial statements, which were examined and found correct by an auditing committee consisting of Harold S. Colton and Wm. A. Kepner. These reports showed a total balance in current funds, December 30, 1913, of $597.22.

The custodian of the permanent fund, J. H. Gerould, reported the receipt of a 15 per cent. dividend on the claim of the society against the Industrial Savings and Loan Company of New York.

A finance committee consisting of Frank R. Lillie, chairman, Caswell Grave and E. G. Conklin, was created to have charge of the investment of the permanent fund and the executive committee was instructed to add to the permanent fund from current funds of the society whenever such action is deemed expedient.

A committee consisting of Henry B. Ward, chairman, G. H. Parker and C. E. McClung was appointed to confer with a committee of three from the American Society of Anatomists on the subject of premedical education.

The "Mathews Plan for the Organization of an American Biological Society" was referred to the executive committee for consideration and report to a future meeting.

The committee of delegates, on which the American Society of Zoologists was represented by G. H. Parker, recommended that the secretaries of the American Society of Zoologists and other affiliated societies consult with the secretary of the American Society of Naturalists as to the place of future meetings. This recommendation was approved by unanimous vote.

The recommendation of the executive committee that a list of members, and the new constitution and by-laws of the society be published this year by the secretary was also approved.

At meetings held on December 29, 30 and January 1, the following papers were read either in full or by title:

COMPARATIVE ANATOMY

The Intestinal Epithelium of Trematodes: HENRY S. PRATT.

A Contribution to the Evolution of the Cestode, Rostellum: FRANKLIN D. BARKER. (Illustrated with lantern slides.)

Barker and Adson have recently described a new genus and species of Cestode, *Proteorostellum sphærulum* from the intestine of softshell turtles.

This form differs from the other known genera of the *Proteocephalidæ* in having a well-defined apical organ on the head or scolex. Other morphological and histological differences also distinguish this form.

In order to arrive at the correct interpretation of this organ a careful comparative study of the various apical structures found in cestodes was made.

The comparative study shows that the apical organ of this new cestode from the turtle is neither end-organ, terminal sucker nor muscle-cone. The rostella of different cestodes vary greatly in their structural complexity so that several distinct grades may be recognized. Comparisons with these rostella clearly shows that the apical organ of the turtle cestode is a rostellum of a very simple type.

It seems then that we have in this rostellum the simplest and most primitive type of cestode rostellum yet described and one which possibly represents the prototype from which the more complex types have evolved. A well-defined series of rostella, developing in complexity, can be established, beginning with this very simple type found in the turtle cestode.

On the basis of this series of cestode rostella we would define the cestode rostellum as an organ varying in size, shape and complexity; having a definite individual musculature, intrinsic, extrinsic or both; more or less retractile; armed or unarmed; situated on the apex and equidistant from the acetabula of the cestode scolex. A more detailed discussion of this question will appear in a paper soon to be published from this laboratory by Geo. M. Covey on "The Microscopic Anatomy of *Proteorostellum sphærulum* Barker and Adson."

Further Notes on the Embryonic Skull of Eumeces: EDWARD L. RICE.

A. Secondary Tympanic Membrane.—Gaupp emphasizes the contrast in position of the secondary tympanic membrane of the mammals and the physiologically similar membrane stretched between the rim of the fenestra cochleæ and the lateral margin of the basal plate in *Lacerta.* Observations on *Eumeces* largely bridge this gap and indicate a real homology not recognized by Gaupp. Early stages agree with *Lacerta;* in later embryos the membrane is clearly a part of the wall of the otic capsule.

B. Exit of Glossopharyngeal Nerve.—The above interpretation helps to harmonize the seemingly contradictory data concerning the course of the ninth nerve in the reptiles, described as "Extra-capsular" in *Lacerta, Hatteria* and the *Crocodilia,* and as "intra-capsular" in *Chelone, Eruys* and *Tropidonotus.* The cause in both cases may be interpreted as intra-capsular, the penetration of cartilage or connective tissue depending on the relative extent of these tissues in this part of the otic capsule, *i. e.,* upon the size of the fenestra cochleæ. Observations on *Eumeces* confirm this view. Some specimens agree fully with *Lacerta;* in others the nerve clearly penetrates the cartilage of the median walls of the capsule, although no lateral penetration of the cartilage has been observed. These variations are not correlated with age.

Observations on Sympathetic Ganglion Cells: F. W. CARPENTER.

The Vascular System of the Florida Alligator: A. M. REESE.

The Morphology of the Pectoral Spine and Gland in Certain Catfishes: H. D. Reed. (With demonstration.)

The Innervation of the Integument of Chiroptera: J. E. Ackert. (With lantern slides.) (Introduced by Robert K. Nabours.)

The integument of *Myotis lucifugus* (LeConte) and *M. sublatus* (Say), stained *intra vitam* with methylene blue, reveals a number of nervous structures. Among them are free nerve terminations which can be seen most readily in the flying and interfemoral membranes, and which, so far as the writer has been able to ascertain, have not been reported heretofore in these organs.

Nerves end on pelage hairs at three levels and in three different sheaths of the follicles. These endings are: (1) a superficial nerve ring situated ectad of the orifices of the sebaceous glands, and giving off nerve threads in the connective tissue sheath; (2) fine, varicose or flattened nerve fibrils lying immediately entad of the openings of the sebaceous glands, and terminating on the hyaline membrane parallel to the long axis of the hair; (3) nerve fibrils at the level of the lower third of the follicle, usually taking a horizontal position in the outer root sheath. Apparently, nerve endings similar to the last type have not been described previously in the hair of the bat.

The skin contains two kinds of special sensory end-organs: (1) a small, elongate *end-bulb* into which a single medullated nerve fiber enters, extends approximately to the opposite end, and terminates in a slight enlargement; (2) a large, round, cellular *terminal corpuscle* innervated by a single fiber which disappears among the cells of the organ. Terminal varicosities are abundant in the region of the hairs outside of the follicles.

In the skin of the face, especially, there are well-developed striated muscles which bear motor end-plates. While some of these plates appear to be beneath the sarcolemma in the integument, they are unquestionably so placed in the muscles of the tongue.

Of interest are the large, modified sweat glands, some of which have numerous fibrils running about them. In the absence of definite observations on the innervation of sudoriparous glands, it seems possible that these fibrils, which resemble sympathetic post-ganglionic neurites, may form plexuses about the glands similar to intracapsular plexuses around cell bodies of sympathetic neurones.

Blinded bats when on the wing probably perceive obstacles through the sense of touch by the effect of condensations of the atmosphere (produced on approaching the object) upon the free nerve terminations in the epidermis and the superficial nerve rings of the hair follicles.

EMBRYOLOGY

On the Parallelism Between Increase in Permeability and Abnormal Development of Fish Eggs: J. F. McClendon.

The morphology of abnormal *Fundulus* embryos has been studied by Dr. Stockard. My work has been merely an attempt to find the cause of the abnormalities.

I found that distilled or sea-water solutions of nicotine and the salts of Na, Li, K, Ca and Mg all produced the same abnormalities in the embryos. In other words, any one of the above substances produced all of the types of abnormalities when applied to eggs in early cleavage stages.

If the eggs are placed in distilled water or "balanced" salt solutions no salts diffuse out of them. Only the kations have to be balanced; for example, if eggs are placed in a solution containing nitrates of Na, K, Ca and Mg, no chlorides diffuse out of them.

But if the eggs are placed in distilled-water solutions of any one of these substances, the salts contained in the eggs diffuse out into the solutions and may be detected by ordinary chemical analysis. It is thus shown that solutions which cause abnormalities also increase the permeability of the eggs to salts (and perhaps to other substances).

Solutions that were too weak or had acted for too short a time to produce abnormalities, had increased the permeability of the eggs to a slight degree. Therefore, the increase in permeability seems to be the cause and not an effect of the abnormal development.

The Effect of X-rays on the Rate of Cell Division in the Early Cleavage of Planorbis: A. Richards.

An Experimental Study of Concrescence in the Embryo of Cryptobranchus allegheniensis: Bertram G. Smith. (Illustrated with lantern slides.)

By the method of vital staining the following facts concerning the formation of the embryo of *Cryptobranchus* were established: (1) A band of cells occupying the lateral and ventral parts of the equatorial region of the late blastula, during gastrulation comes to occupy the corresponding parts of the margin of the yolk plug, and converges on

the site of the closing blastopore. (2) During gastrulation there is a confluence of material lying in the region of the dorsal lip of the blastopore; in connection with the process of overgrowth and in turning of the dorsal lip of the blastopore this material shifts from either side toward the median line. (3) The movement of the neural folds is a movement of translation, not a wave movement. The neural folds include material originally situated at least 90 degrees apart, which is thus brought into apposition in the median line.

The bearing of these facts on the theory of concrescence will be discussed when the paper is published in full.

The Behavior of the Skeletons in Experimentally Fused Larvæ: A. J. GOLDFARB.

On the Behavior of Sea-urchin Embryos When Incorporated in Sea-urchin Lymph Plasmodia: H. V. WILSON.

Segmenting eggs included in lymph plasmodia, eventually in wound membranes, continued to develop for a time. Many reached through radial elongation of the blastula cells and subsequent delamination a solid (sterroblastula) stage, after which the cells became dissociated, lying scattered or in amorphous masses in the midst of the general plasmodium. A large amount of the embryonic tissue underwent degeneration. On the other hand, groups of small dissociated blastomere cells established connection with one another and the general lymph plasmodium through the development of protoplasmic processes. They thus went so far as to become a part of the syncytium which constitutes the regenerative tissue. Their further fate could not be traced, and the evidence as to their permanency is thus negative.

In some of the experiments a considerable number of segmenting eggs remained adherent to the surface of the plasmodium. The development of these was near the normal. About the time when the cells acquire cilia, instances of fusion between the blastulæ were common. While the further development of these giant blastulæ was not followed, it would seem that the combination of lymph plasmodium and giant embryos is something essentially like the "syrphoplasmic" masses described by Janssens (1904).

A Pair of Tracheal Invaginations on the Second Maxillary Segment of the Embryo of the Honey Bee: J. A. NELSON.

At a period shortly after the completion of the germ layers, and contemporaneous with the appearance of the rudiments of the appendages and of the stomodæum, a pair of tracheal invaginations appears on each of the ten segments caudad of (but not including) the prothoracic segment. These invaginations by branching give rise to the tracheal system. At the same time a pair of invaginations appears on each side of the second maxillary segment. These occupy a position on this segment similar to those of the tracheal invaginations of the trunk segments, and are also similar to them in size and general appearance. Each of the tracheal invaginations of the second maxillary segment is directed somewhat caudad, and develops with great rapidity into a sac with four diverticula and a constricted external opening. One of the diverticula is directed caudad, one dorsal and the other two cephalad.

The external opening of the tracheal invagination now closes completely, the branched sac thus formed being cut off completely from the hypodermis. The caudad diverticulum of the sac now extends further caudad to meet and unite with the cephalad diverticulum from the tracheal invagination of the second thoracic segment. The dorsal diverticulum extends toward the dorsal mid line, where it meets and fuses with the corresponding diverticulum of the opposite side, forming the anterior tracheal loop or commissure of the main tracheal trunks. The two cephalad diverticula form tracheal branches supplying the brain and the muscles of the cephalic appendages. The tracheal invaginations on the second maxillary segment, therefore, produce a portion of the anterior end of each of the main tracheal trunks, in addition to the tracheæ found in the head.

Tracheal invaginations were described by Hatschek in 1877 in the gnathal segments of a lepidopterous larva. Examination of Hatschek's figures show that these invaginations were those forming the tentorium and mandibular apodemes, and they have generally been so regarded. Tracheal invaginations have not since been described in the head of any insect embryo.

Further Studies on the Development of the Cranial Sympathetic Ganglia in Vertebrates: ALBERT KUNTZ.

The Early Cleavage of Cirratulus Grandis, Verrill: JOHN W. SCOTT. (Illustrated with lantern slides.)

In common with most annelids the cleavage is unequal. It differs from other marine annelids in that cleavage becomes very irregular after the 8-celled stage. The egg is further characterized by the peculiar and important behavior of the yolk

lobe. The egg shows a high degree of organization at an early stage. Whatever may be the significance of the yolk lobe, it is an adaptation associated with early cleavage, apparently correlated with the karyokinetic figure; it aids in producing unequal cleavage; it isolates cell materials, so that they are unaffected by early transformations of the nucleus; and, in *Cirratulus*, it appears to aid in the arrangement of the cell pattern. Conklin's theory ('12), that the yolk lobe is due to a weak spot in the protoplasmic pellicle, through which the lobe is forced out by "mitotic pressure," is inadequate. For this theory would not explain the non-appearance of the lobe in *Cirratulus* at the third cleavage, though it appears in both earlier and later stages.

A Solution of the Problem of Yolk Manipulation by Ophiura: CASWELL GRAVE.

The egg of the brittle-star, *Ophiura brevispina*, contains a very large amount of yolk and in its cleavage and early development this yolk, in the form of minute spherules, is equally distributed to all of the cells.

In its yolk distribution it, therefore, does not differ from the eggs of other Echinoderms but does differ greatly from those eggs of Arthropods, Molluscs and Vertebrates which are rich in yolk. In the latter, the yolk is early segregated either into a few inert cells or into a portion of the egg from which the active cells withdraw during development.

In consequence of the large amount of yolk in the egg of *Ophiura* and of its equal distribution to every cell during segmentation and early development, a comparatively large amount of the energy of the egg is expended in the manipulation of its yolk content. For example: the resting cells of the blastula have the form of slender prisms, their length being to their breadth as nine is to one. During its mitosis, however, each cell becomes approximately spherical in shape. Connected with this enormous change in shape and position of a dividing cell, there takes place a very considerable readjustment of adjacent cells and their contents and especially an entirely new arrangement of the yolk spherules of the dividing cell.

The interesting observation herein reported is that this expenditure of energy in juggling with yolk spherules ceases when a stage in larval development is reached in which the gut and cœlom are differentiated. At this stage the cells extrude practically all of their supply of yolk into the blastocœle cavity. The redistribution of this mass of yolk to the tissues of the organism is a function of amœboid mesenchyme cells.

CYTOLOGY

The Nerve Centers of the Electric Organ in Raja Punctata: ULRICH DAHLGREN. (Illustrated with lantern slides.)

The X-element of Plymouth Rock Fowls: M. F. GUYER. (With demonstrations.)

Chromosomal Variations in the European Earwig, Forficula Auricularia: F. PAYNE.

Spermatogensis in Chrysemys marginata and Cistudo carolina: H. E. JORDAN.

Chromidia appear to originate in the spermatogonia by a process of extrusion of chromatic particles from the nuclear recticulum. In *Chrysemys* the chromosomes during early growth stages are aggregated in or upon the nucleus; from here they disperse as small paired granules or rods; subsequently the chromosomes enlarge; the typical synapsis figure is absent. The nucleolar residue persists in part as a compact oval or paired-rod element, suggesting an accessory chromosome. The haploid number of chromosomes is 17, including one larger U-shaped element which passes apparently undivided (frequently as a pair of rods) and in advance of the other chromosomes to one pole of the first maturation spindle. In *Cistudo* a typical synapsis figure appears; the haploid number of chromosomes is 16; and there is no evidence similar to that in *Chrysemys* suggesting an X-element. Numbers of the secondary spermatocytes apparently divide amitotically, perhaps an abnormal condition.

A Microscopical Investigation of Tissues From Dogs Which Fasted Extremely Long Periods of Time: S. MORGULIS, P. E. HOWE AND P. B. HAWK.

The Germ-cell Cycle in Animals: R. W. HEGNER.

Of the nine periods into which the germ cell cycle in animals may be divided, two were discussed: (1) Cyst-formation in the testis of the potato beetle, *Leptinotarsa decemlineata*, and (2) the localization of the germ-cell substance in the unsegmented egg. At a certain stage in the multiplication period the spermatogonia of the potato beetle become each surrounded by epithelial cells. Each spermatogonium divides by mitosis and the daughter cells can be identified because of connecting strands—the remains of the spindle. These spindle-remains enable one to prove conclusively

that all of the spermatozoa in a single cyst arise from a single spermatogonium. These divisions constitute a period which parallels that in *Dytiscus* during which one oogonium produces fifteen nurse cells and one oocyte. The germ cell substance in many animals is localized in the unsegmented egg and can be distinguished by the presence of stainable inclusions which may be named keimbahn-determinants.

The Orientation of the Nuclear Organs in the Electric Motor Cells of Tetronaree and Other Torpedoes: ULRICH DAHLGREN. (Illustrated with lantern slides.)

Chromosomes in Opalina: M. M. METCALF.

The Physical Changes in Marine Eggs in Fertilization: G. L. KITE. (Illustrated with lantern slides.) (Introduced by C. E. McClung.)

The Molar Structure of Protoplasm: G. L. KITE. (Introduced by C. E. McClung.)

The conclusions presented in this paper are founded on the dissection of representative cells of widely different types of animals and plants. A detailed investigation of the principal kinds of cells of the frog and rabbit has been made.

Protoplasm has been found to be composed of gels and sols. With few exceptions resting nuclei are rather rigid gels which contain denser areas. Such areas are frequently arranged in the form of imperfect networks. The cytoplasm is usually in the gel state and may contain globules, granules and fibrils. The globules are completely separated from the imbedding gel, while granules and fibrils grade into the contiguous substance.

Dividing cells have proved to be of special interest. Chromosomes and spindle fibers seem to be incomplete separation products. The changes which result in the separations are at least partially reversible. Experiments on different kinds of dividing cells point unmistakably to the fact that the chromosomes and spindle fibers play a secondary rôle in indirect cell-division. The optically undifferentiated protoplasm, lying around and between the chromosomes and spindle fibers and in the plane of cleavage, is the portion that is the seat of the active changes that result in cell-division.

The chief general conclusion from this study is that protoplasm is a one-phased system in molar structure. Dissections of cells under quite satisfactory optical conditions have failed to reveal the contiguous solid and liquid phases that are generally held to be the essential elements of protoplasm.

GENETICS

A Male Gynandromorph of Colias (Eurymus) Eurytheme Showing Dimorphism in the Female Color Pattern: JOHN H. GEROULD. (Illustrated with lantern slides.)

Inheritance in Orthoptera: ROBERT K. NABOURS.

During five years many types with complex color patterns of *Paratettix* Bolivar, of the Orthopteran subfamily Tetriginæ, have been captured and bred in the greenhouse, for two years at the University of Chicago and three years at the Kansas Agricultural College, Manhattan. From these have been segregated through Mendelian analyses about fifteen true breeding types. These true breeding forms have been recombined to make all the original hybrid types and many others which have not as yet been found in nature. Ten true breeding types have been tried, and, with one exception, each has been found to pair with each of the others, making as many allelomorphic pairs as there are possible combinations. Some of the cultures have been carried to the F_6 generation, and some of the forms have been bred, in one combination or another, for sixteen generations. The results throughout have been typically Mendelian, except that one form, *P. melanothorax* (*G*), when crossed with any other form, produces F_1 progeny that do not always give gametes alternatively, but seem to give some gametes that represent both parents. For instance a *melanothorax* (*G*)—*leuconotus* (*B*) hybrid mated with a *leucothorax* (*C*) homozygous form gives *CG*, *BC* and *BCG* progeny. Reciprocal crosses have invariably given identical results.

The Effect of Selection Upon Egg Characters in Parthenogenetic Lines of Hydatina: A. FRANKLIN SHULL.

Fifty Generations of Selection in Parthenogenetic Pure Lines of Daphnids: A. M. BANTA.

Selection experiments in pure parthenogenetic lines of daphnids were reported on. In all eighteen lines were continued under selection for eight generations or longer and eleven for from thirty to fifty generations. The daphnids belong to three species and were originally taken from several different ponds near Cold Spring Harbor. Fourteen of these lines are *Daphnia pulex*, two belong to another species of *Daphnia* and two are *Simocephalus*.

The character used as the basis for selection was purely a physiological one, the daphnids' reaction to light. In the beginning of the experiment the

first brood from a young mother was placed in the experimental tank under carefully controlled conditions and while still only a few hours old. The first one of these young to reach the positive end of the tank was selected for the beginning of the + stain and the one last reaching the positive end, or failing to reach it within a given time, for the beginning of the — strain. In a similar manner the selections were made in later generations. To August first for the whole period during which selection had been continued the mean reaction time of the + strains of four of the lines was greater than the mean reaction time of the corresponding — strains, this indicating presumably a greater responsiveness to light on the part of the + strains in spite of the selection for the reverse effect. Two of these differences are statistically significant, as they are more than two and one half times the probable error. In fourteen of the eighteen lines the — strains have a higher reaction time than the corresponding + strains and in eight of these the differences are statistically significant. Of the lines selected for from thirty to fifty generations two have a higher mean reaction time in the + strain and nine in the — strain. The two former and six of the latter differences are statistically significant.

Size Differences in the Spermatozoa from Single Testes: Charles Zelenya and E. C. Faust.

Measurements were made of the length of the head in five hundred or more spermatozoa of each of twelve species of animals. The variation curves plotted from these measurements were used in determining the probable presence or absence of size dimorphism.

In *Anasa, Lygæus, Alydus, Musca, Melanoplus femur-rubrum, Melanoplus differentialis* and *Phytonomus* among insects and *Pseudomys* and *Bos* among vertebrates the curves are distinctly bimodal and indicate the presence of two size groups. The inference is made that the group of larger spermatozoa is the one with an *X* chromosome and the group of smaller spermatozoa the one without an *X* chromosome.

Segregation of Traits in a Pennsylvania Family: Wilhemine E. Key.

Some Reactions of the Shell of the Pond Snail, Lymnæa, to External Conditions: Harold S. Colton.

A Quantitative Basis of Sex as Indicated by the Sex Behavior of Doves From a Sex Controlled Series: Oscar Riddle.

By his method of controlling sex in pigeons Whitman showed (1) that the first young of the season (spring and early summer) were nearly all males, and young hatched from the later eggs of the season were nearly all females; (2) that if the two sexes arise from the two eggs of any one clutch, that it is in nearly all cases the first egg which produces the male, and the second egg of the clutch that produces a female; (3) that birds kept thus mated and overworked at egg-production tend to produce in succeeding years fewer and fewer males before the appearance of females.

A study of the sex behavior of the females of one such series (reciprocal cross of *T. orientalis* × *S. Alba*) has shown (1) that the females (dark in color) of the *alba* × *orientalis* cross are more masculine in their sex behavior (*i. e.*, function more times as males in copulation) than the females (white in color) of the reciprocal cross; (2) *that females of either cross hatched early in the season, i. e., closest to male-producing conditions, are more masculine in their sex behavior than their own sisters hatched late in the season from eggs produced under strongest female-producing conditions;* (3) that two full sisters hatched from the two eggs of a single clutch most strongly contrast with each other. *The bird from the first or male-producing egg of the clutch usually taking the part of the male to a full 100 per cent.*

The injection (over a period of one month) of extracts and suspensions of ovarian tissue into the more masculine of these females, with simultaneous injections of testicular extract and suspension into the more feminine of the pair, *has succeeded in some cases in very strongly reversing the sex behavior of the pair.* The effect persists more than 25 days after the last injection.

The behavior itself, and the effects of the extracts, have been recorded on moving picture films.

These two results together with our very abundant data on the storage metabolism of the ova of these forms, and the initial fact of sex control itself, strongly indicate that the basis of sex is a fluid, reversible process; that the basis of adult sexual difference is a *quantitative* rather than a *qualitative* thing.

Size Inheritance in Rabbits: E. C. MacDowell. (Introduced by W. E. Castle.)

To test the hypothesis that the apparent blending inheritance shown by Castle's work on the ear length of rabbits may be interpreted by the multiple factor hypothesis established by Nillson-Elbe,

these experiments were planned and started by Professor Castle. They were handed over to the writer in the fall of 1909. Crosses were made between rabbits of large and small body size; the offspring were crossed back to the parents to produce a back-cross generation. Based upon the statistical study of bone measurements and body weight as estimated from growth curves, it was found that the back-cross was more variable in size than the first generation. This was shown by standard deviations as well as by classifications of the actual measurements in relation to the parents. Certain measurements from the back-cross rabbits reached and exceeded the parental extremes. The means of both generations were very close to the mid-parentals in both generations. All these facts would be expected if the multiple-factor hypothesis be used to construct a mechanism to account for size inheritance. The increased variability would be due to a segregation of size factors.

CASWELL GRAVE,
Secretary

(*To be continued*)

THE ENTOMOLOGICAL SOCIETY OF AMERICA

THE eighth annual meeting of the Entomological Society of America was held at the Atlanta Medical College, Atlanta, Ga., December 30 and 31, in affiliation with the American Association for the Advancement of Science. In the absence of President Bethune, the meetings were presided over by Dr. Philip P. Calvert. The meetings were all well attended, there were about fifty members and fellows in attendance.

The following papers were presented:

"The Structure of the Hind Intestine of *Corydalis*," by J. T. Lloyd.

"Observations on the Habits and Life-history of *Hydromyza confluens* Loew.," by Paul S. Welch. (Read by title.)

"New Characters in the Classification of Microlepidopterous Larvæ," by Stanley B. Fracker.

"The Poison Glands of *Euproctis chrysorrhœa* Linn.," by Cornelia F. Kephart. (Presented by W. A. Riley.)

"The Tracheation of the Anal Area of the Wings of the Lepidoptera and the Homology of the Veins," by N. L. Partridge. (Read by title.)

"The Box-elder Bug in Ohio," by Herbert Osborn.

"The Elytral Tracheation of the Subfamilies and Genera of Cicindelidæ," by V. E. Shelford.

"Some Interesting Structures in the Pupæ of Lepidoptera," by Edna Mosher.

"Some Sources of Error in the Interpretation of Insect Tissue," by W. A. Riley.

"*Conventzia hageni* Banks, Life-history Notes and Variations in Wing Venation," by J. S. Houser.

"Notes on the Head Structures of Thysanoptera," by Alvah Peterson. (Read by title.)

"The Desirability of a Biographical Dictionary of Entomologists," by Philip P. Calvert.

The afternoon of the thirtieth was devoted to a joint session of Section F of the American Association for the Advancement of Science and the Entomological Society of America, at which the following papers were presented:

"Note on the Present Status of the Gipsy Moth Parasites in New England," by L. O. Howard.

"Some Notes Regarding the Natural History of the Mole Cricket," by E. L. Worsham.

"Notes on Some Old European Collections," by H. T. Fernald.

"Studies on the Snowy Tree-cricket, *Œcanthus niveus*, with References to Apple Bark Diseases," by P. J. Parrott, W. O. Gloyer and B. B. Fulton. (Presented by P. J. Parrott.)

"Collecting Insects in the Okefenoke Swamp," by J. Chester Bradley. (Presented by J. G. Needham.)

"Studies on the Geographical Distribution of Leaf-hoppers, Especially of Maine," by Herbert Osborn.

"The Fauna of Epiphytic Bromeliads in Costa Rica," by Philip P. Calvert.

The morning of the thirty-first was devoted to the presentation of the report of the executive committee, at which was reported the election of fifty-four new members and the election of Dr. C. Gordon Hewitt and Dr. William Barnes as fellows; the presentation of the reports of standing committees; the election of officers; the adoption of the report of the committee to hold a summer meeting in 1915 on the Pacific coast; the appointment of a committee to consider the desirability of starting the publication of a series of special works on entomology like that of the Ray Society, and the reading of the following papers:

"The Dispersal of *Musca domestica*," by James Zetek. (Presented by S. B. Fracker.)

"A Comparison of the Enemies of *Toxoptera graminium* in South Africa and the United States," by William Moore. (Presented by F. L. Washburn.)

"Life-history Notes on *Psephenus lecontei* and *Hydroporus septentrionalis*," by Robert Matheson. (Read by title.)

"The Sequence of Color Changes During Ontogeny in *Cicindela*," by V. E. Shelford.

"Notes on the External Anatomy of Some Pentatomidæ," by R. W. Leiby.

"The Biology of *Gelechia gallæsolidaginis* with Some Reference to Some of Its Parasites," by L. S. Barber.

"A Little Known Wire-worm, *Horistonotus uhleri*," by A. F. Conradi.

"The Life-history of a Species of Psychodidæ," by Leonard Hazeman. (Read by title.)

"The Structure of the Thorax in Generalized Insects," by A. D. MacGillivray.

"Behavior of *Anopheles tarsimaculata* Goldi," by James Zetek. (Read by title.)

"Life-history of *Elophila magnificalis*, an Aquatic Lepidopteron," by J. T. Lloyd. (Read by title.)

The following officers were elected for 1914:

President—Dr. Philip P. Calvert, University of Pennsylvania.

First Vice-president—Dr. James G. Needham, Cornell University.

Second Vice-president—Dr. C. Gordon Hewitt, Dominion Entomologist.

Secretary-treasurer—Dr. Alex. D. MacGillivray, University of Illinois.

Additional Members of the Executive Committee—Professor Herbert Osborn, Ohio State University; Dr. W. M. Wheeler, Harvard University; Professor Vernon L. Kellogg, Leland Stanford Junior University; Mr. Nathan Banks, United States National Museum; Dr. E. P. Felt, State Entomologist of New York, and Professor J. M. Aldrich, United States Bureau of Entomology.

Member of Committee on Nomenclature—Professor T. D. A. Cockerell, University of Colorado.

The next meeting will be held in Philadelphia, Pa., in affiliation with the American Association for the Advancement of Science.

Alex. D. MacGillivray,
Secretary

SOCIETIES AND ACADEMIES

THE AMERICAN MATHEMATICAL SOCIETY

The one hundred and sixty-eighth regular meeting of the society was held at Columbia University on Saturday, February 28. The attendance at the two sessions included forty-two members. Vice-president L. P. Eisenhart occupied the chair. The following new members were elected: Mr. E. W. Castle, Princeton University; Professor P. J. Daniell, Rice Institute; Mr. L. R. Ford, Harvard University; Mr. C. M. Hill, State Normal School, Springfield, Mo.; Dr. R. A. Johnson, Adelbert College; Dr. L. M. Kells, Columbia University; Dr. W. W. Küstermann, Pennsylvania State College; Professor J. F. Reilly, State University of Iowa; Professor F. B. Williams, Clark University. Nine applications for membership were received.

An amendment of the constitution was adopted by which the secretary of the Chicago Section becomes *ex officio* a member of the council.

The following papers were read at this meeting:

H. S. Vandiver: "Note on Fermat's last theorem."

G. M. Green: "One-parameter families of space curves, and conjugate nets on a curved surface."

G. M. Conwell: "Brachistochrones under the action of gravity and friction."

R. D. Beetle: "A formula in the theory of surfaces."

C. A. Fischer: "The Legendre condition for a minimum of a double integral, with an isoperimetric condition."

A. R. Schweitzer: "A generalization of functional equations."

A. R. Schweitzer: "Some critical remarks on analytic realism."

E. V. Huntington: "A graphical solution of a problem in geology."

H. Galajikian: "A relation between a certain non-linear Fredholm equation and a linear equation of the first kind."

Dunham Jackson: "Note on rational functions of several complex variables."

E. B. Wilson: "Infinite regions in geometry."

H. Bateman: "The structure of the aether."

F. R. Sharpe and Virgil Snyder: "Birational transformations of certain quartic surfaces."

F. R. Sharpe and C. F. Craig: "An application of Severi's theory of a basis to the Kummer and Weddle surfaces."

B. E. Mitchell: "Complex conics and their real representation."

W. H. Roever: "Analytic derivation of formulas for the deviation of falling bodies."

The next meetings of the society will be held at Chicago, April 10–11, and at New York, April 25.

F. N. Cole,
Secretary